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EDITORIAL

THE Conference of the Food and Agriculture Organization, meeting at Geneva in 1947 for its third annual session, passed a resolution calling for a forestry conference in Latin America. The Government of the United States of Brazil offered to act as host, and accordingly the International Forestry and Forest Products Conference for Latin America will be held from 19 to 30 April 1948 at Teresopolis, near Rio de Janeiro.

The Constitution of the Food and Agriculture Organization of the United Nations has laid down the great objective and the final aim to which all its work must tend — to better the standard of living of the world's peoples. It is in this light that all developments in the domain of forestry and forest products must ultimately be considered.

The purpose of the forthcoming Conference will be to lay the groundwork for the development of Latin America's forest resources so as to benefit her countries and thereby contribute to the betterment of the standard of living of her peoples. In the process of this development, it is likely that a timber surplus will accrue. This surplus might become available to the world's markets, in particular to those areas now suffering from timber shortages. It must be well understood, however, that this can be only a secondary objective and subservient to the first.

The world is facing a serious timber crisis just at a time when technical progress is opening vast fields for the use of wood. Latin America probably has larger undeveloped forest resources than any other continent and their potential significance for the industrial development of this continent has been well understood by a number of Latin-American governments. Indeed, far-reaching programs for the establishment of modern forest industries have been initiated in a number of countries and are being considered in many others.

Today, circumstances for proceeding from plans to action are particularly favorable: the whole world is suffering from a shortage of forest products. Newly established forest industries, therefore, have a good outlook for finding, in addition to the domestic market, substantial outlets abroad at remunerative prices. Since some of the equipment needed for these industries will have to be imported from abroad, exportation of forest products should provide the means to pay off installation costs, even in foreign currencies, over a relatively short period of time: this assurance in turn should make it easier to secure investments and credits where they are needed.

The establishment of modern forest industries would in itself become an important factor in the progressive industrialization of this continent and in a gradual raising of living standards involving an ever larger domestic consumption of forest products. Even if the import requirements of other continents should fall off in time, it is more than probable that the output of Latin America's new forest industries would be absorbed by the growing needs of her peoples.

THIS ISSUE OF UNASYLVA is meant to give some background information concerning the problems and facts the Conference will have to face. In some ways, therefore, it will be a special issue although the accepted pattern of the magazine and its division into four parts has been retained and only the first two parts are devoted exclusively to questions related to the Latin-American Conference.

It endeavors to present two main aspects of Latin America's forest resources: their stupendous wealth on the one hand, best exemplified by the limitless expanse of tropical forest of the Amazon basin, and, on the other hand, the difficulties of their rational management and the disastrous effects, such as soil erosion, which swiftly follow their destruction.

Because all thinking about Latin-American forestry must preserve this balance between riches and limitations, the wealth has been dealt with in two articles and the difficulties and dangers in two articles: first the riches are considered as part of the world-wide problem of tropical forestry, then in detail, and from the specifically Latin-American point of view. The limitations are then discussed: first as physical problems arising from deforestation as they have become apparent through soil erosion and deterioration of water supply in certain countries, then as an economic problem of steadily increasing populations with growing forest products requirements which will grow still larger with further progress.

The first article in this issue, "Outline of a General Forest Policy for the Tropics," places one of the major problems of the utilization of Latin-American forest resources in its proper perspective against a world-wide background. Because conditions are fundamentally similar for all tropical forest regions, these problems must be considered as being of global extent. Experience gained in the past and in other areas can be of benefit to all, if steps are taken to make it accessible and if the requisite machinery is set up to divide the burden of research and to ensure the comparability of results.

The second article in this issue, "Latin-American Forestry Problems," outlines the great possibilities of the continent and the steps taken to translate them into reality. It is a summary of the travel impressions and of the information acquired by two officers of the Division of Forestry and Forest Products during a preparatory visit to Latin America in 1947.

The forest resources of Latin America, rich though they may be, must not be thought of as an inexhaustible treasure-house from which a whole world can enrich itself: it is only by prudent management that they will remain a lasting asset; forests are always an inheritance that is held in trust by one generation for the next. This is the main theme of the third article, "Latin-American Timber, Ltd.," which points out that Latin America has its own grave problems of soil erosion and water supply. Utilization must be linked with conservation; otherwise, the development of forest resources may well entail irreparable damage.

The purpose of the fourth article, "Consumption and Production of Paper and Paperboard in the Twenty Latin-American Republics, 1935-1946," is to show, by dealing with one specific category of forest products, the possibilities of future development of internal consumption. Foresters deal in a commodity that takes so long to reach maturity that they must think in terms of both the present and future generations. When planning development of the forests of Latin America as a source of increased supplies for domestic and world markets, their vision must embrace not only the present population of the Latin-American countries and their needs but also the increased populations and the greater needs of the future.

In Part II, which bears the title "National Situations," it was thought worth while to compile a summary of available data relating to each country. The information listed by countries is the best available to FAO at the time of writing.

The articles contained in Parts I and II may be considered as basic material for the coming conference. It was thought, however, that they were of sufficent interest to warrant presentation to a wider public. Part III — "The Work of FAO," and Part IV — "News of the World," continue the usual pattern of our review and cover matters of general interest.

A wish has been expressed by many readers for some form of bibliographical service. To undertake this task would not only overtax the present capacity of FAO's Division of Forestry and Forest Products but would also duplicate work already being done. A compromise solution has, therefore, been sought. The U. S. Department of Agriculture has generously made available to FAO, for incorporation as a loose insert in this issue, those chapters of its bibliography which deal with forestry and forest products. FAO gratefully acknowledges this co-operation and, if our readers approve, we shall continue, and expand this or similar arrangements in subsequent issues.

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Unasylva is prepared by the Division of Forestry and Forest Products and published by the Information Service of FAO at the Organization's temporary headquarters in Washington, D. C. It is printed in Baltimore, Maryland, U. S. A.

Unasylva is now published in English and French editions. The current issue, which is devoted to Latin-American forestry problems, is also published in Spanish, and regular Spanish editions are planned for the near future.

Distributing agents are being selected for various countries and areas. Meanwhile, orders for subscriptions or individual copies are being taken by the Documents Office, FAO, 1201 Connecticut Avenue, N. W., Washington 6, D. C., U. S. A. Annual subscription, $3.50; single copy, 65 cents.

Corrections. *In issue No. 3 of Volume I, 1947, the following errors occur:*
Page 46 (third column): France: The total shown under "Surface (hectares)" should read 357,655, not *357,665.*
Page 47 (first column): The first figure in the first line should read 22,515,027, not *2,515,027.*

Outline of a General Forest Policy for the Tropics

By JUSTUS W. GONGGRYP

Vast tropical forests make up about half of the world's total forest area, according to the most up-to-date report in FAO's Forestry and Forest Products—World Situation, 1937-1946. *This estimate, like previous ones, includes large areas of unproductive forests. As knowledge of the tropical forests is vague and uncertain, a great deal of additional study is necessary on their areas, species, stands, growth, and silviculture.*

Wherever tropical forests exist—in South America, Africa, or the Far East—there are basic similarities in the essential problems on which investigation is urgently needed. Constructive measures which will aid in making the resources of these forests equally useful to the people of the tropical countries and to the wood-hungry peoples of the temperate zones are also fundamentally the same.

This article, based on many years' study of the tropical forests and their problems, undertakes to sketch some of their common characteristics and to suggest productive lines of endeavor for the future.

As a result of the general feeling that the upheaval of the war would necessitate revised ideas of available economic resources, including forests, a number of countries have undertaken surveys. Thus, the United States Forest Service has initiated a series of reports entitled *A Reappraisal of the Forest Situation.* The United Kingdom also officially issued a *Report on Postwar Forest Policy,* and without doubt the governments of other nations are fully aware of the urgency and complexity of the problems treated in such reviews.

The *Third Report to the Governments of the United Nations by the Interim Commission on Food and Agriculture* observes that fears have been expressed that the forest resources of the United States and Canada may in the near future become insufficient to supply the raw material for North America's growing pulp industry. The same trend exists on a world-wide scale.

This study is based upon the assumption that an abundant and continuous supply of wood and other forest products from forests throughout the world, including those of the tropics, is essential for the realization of an expanding world economy and a higher standard of living. This does not mean that all the forests in the world are to be brought into production. Many large forests are incapable of producing a sufficient quantity of timber, either because of inaccessibility or because they cannot grow marketable timber. Again, the working of some forests is restricted because of their scenic value, or because they are required for scientific purposes, or in a protective capacity which, in certain cases, may be considered their most important function.

It is certain, however, that the shortage predicted for the production of the temperate forests of the Western Hemisphere is also present in the Eastern Hemisphere. This shortage is felt nowhere more keenly than in Europe. The world cannot afford to have large parts of its productive forests lying idle. It is essential to determine first, where such forests are situated; second, what and how much they can produce; and third, how this production can be realized. This investigation should begin by ascertaining to what extent forest management has already progressed and to what extent the forests of the world have served mankind up to the present time.

Much has already been written on this subject. The *Third Report to the Governments of the United Nations by the Interim Commission on Food and Agriculture* regards forestry as a world problem and emphasizes the need of special consideration with regard to the tropics. An attempt will be made in this article to formulate concisely the various points to be brought

Hauling greenheart logs in British Guiana. Lack of machinery complicates log moving.

Photo by U. S. Forest Service

forward for a future world forest policy for the tropics. The above-mentioned report has stated the necessity for putting the subject on this level.

Role of Forestry in the Tropics

There are certain aspects of tropical forestry which make consideration on an international basis even more urgent than is the case for other parts of the world. One such aspect may be the consequence of the elemental condition of life in tropical countries, a condition which existed before the war, but which has since the war become fraught with further complications because of political changes in several parts of the tropics.

It is an established fact that forest management coincides with a certain maturity of government. An inexperienced government has to be convinced that the expenditure for forest management is a necessity and not the fad of well-meaning, but mistaken, enthusiasts. In a great many cases in the past, this conviction came rather late, after irreparable damage had already been inflicted upon the forests and had affected the welfare of the people dependent upon them.

Excellent results had been achieved before the war by the Forest Services which had been established in several tropical countries, and which were in the process of expansion. In countries invaded after Pearl Harbor, the large majority of local forestry officers were put into prisons or concentration camps. Even in countries where forestry institutions were respected, it is doubtful whether the results achieved will survive the confusion of the postwar period. Countries of the war area which were spared enemy occupation have the advantage of being able to resume their programs more easily, although in some cases conditions have been so changed by the war that maintenance of the old Forest Services is uncertain. Most tropical Forest Services, the oldest of which date only from the middle of the nineteenth century, depended largely for advice and training of personnel on European and American forestry technicians. They were instituted only after governments became convinced of their necessity by the evil consequences of neglect of forest management. It would be tragic, indeed, if the same sequence of mistakes and failures were to be repeated all over again. The consequences would be much more serious, due to greatly increased population, than they were a hundred years ago.

While the productive capacity of the tropical forests is quite sufficient to ensure the attainment of a higher standard of living with reasonably efficient forest management, the neglect of proper measures can result in the utter ruin of a country.

In the so-called primeval forests of Central America, the forester finds traces of Mayan agriculture indicating that these practically uninhabited tracts must have supported a large and highly civilized population several centuries ago. The same is true of tropical Africa where some forests reveal the remains of populations, towns, and civilizations of which even the names are forgotten. On the other hand, evidences are visible throughout the tropics of the terrible havoc man can cause by fire, which may finally result in the creation of deserts. Every forester and soil conservationist knows the seriousness of these trends which have in many cases resulted in the disappearance or the migration of populations. Such occurrences may have been considered unavoidable in the unenlightened past. In these days adequate protective measures are available for promoting the welfare of mankind. They cannot happen automatically, however, but only as a result of careful planning and research.

Evaluation of World Forest Area

Independent evaluations of the total forest area of the world have been made by Zon and Sparhawk, and by Illvesalo and Jalava. Although their methods differed, the figures they arrived at do not differ fundamentally. One objection can be made against both sets of figures, namely that the first requirement for a statistical tabulation is lacking in both cases: there is no exact definition of terms—in this case of what constitutes a forest. The following table gives the mean of the data of these two tabulations, rounded to millions of square kilometers.

Total Surfaces and Forest Areas by Continents

Continent	Total Land Area	Total Forest Area	Coniferous Forests	Deciduous Forests	
				Temperate	Tropical
	(Millions of square kilometers)				
Europe	9.9	2.9	2.0	0.9	—
Asia	42.2	8.3	3.6	2.1	2.6
Africa	29.4	3.2	0.1	—	3.1
North America	21.7	5.8	4.2	1.2	0.4
South America	18.7	8.4	0.5	0.3	7.6
Australia and adjacent isles	9.0	1.1	0.1	—	1.0
Total	130.9	29.7	10.5	4.5	14.7

It might be deduced from this table that all coniferous forests are located in temperate climates. This is not entirely accurate, as some conifers are also to be found in the tropics—for instance, the forests of Caribbean pine, *Pinus caribaea*, in Central America and the West Indies; forests of Parana pine, *Araucaria angustifolia* in South America; forests of *Pinus merkusii* in Sumatra; forests of *Pinus merkusii* and *Pinus insularis* in the Philippines; and forests of *Agathis* spp. in Borneo and New Guinea. Without doubt tropical forestry will find it expedient to increase very extensively the area under conifers. However, the greater part of the existing 10 million square kilometers of coniferous forests are situated in the Northern Temperate Zone where they constitute by far the most important economic section of the forest area.

In 1935, the Comité International du Bois (CIB) ascertained that 92 percent of world imports of wood were made up of conifers. Practically all of this enormous mass of over 50 million m^3 of wood came from the forests of Europe and North America. The share of the world's timber trade coming from the tropics was so small that the CIB specifically stated that details of trade in tropical woods were of insufficient importance to record.

In the years just preceding World War II, a rough estimate made in *Intersylva*[1] sets the export of wood

[1] *Intersylva*, Journal of the International Forestry Center, II (1942), p. 242.

from the tropics to countries of the temperate zones at approximately 2 million m^3 annually. Imports of wood or wood derivatives greatly exceeded this figure. The International Institute of Agriculture's figures[2] show that, in Africa, over a period of years, the value of wood and forest products imports exceeded exports by amounts varying from 34 to 90 million gold francs annually.

Another estimation[3] puts the surplus of imports of wood over exports at 2.5 million tons for Africa. It can be assumed that the greater part of this came from Europe. In a similar way the forests of North America supplied the requirements of Central and South America. Although the forests of Southern Asia were more productive than those of Africa, perhaps it is not generally known that to a large extent the packing cases in which tea, rubber, and other products were exported from Malaya, India, and elsewhere in the East came from Finland. Countries such as China and Japan, which could have been supplied with timber from Southeast Asia, imported large quantities of wood from North America. Figures may become available later on which will corroborate these claims in detail. There is no doubt, however, that up to World War II the tropics constituted a drain on the resources of the Northern Temperate Zone and in this respect had to be considered as a liability rather than an asset.

A similar situation obtains in a number of South American countries.[4] Costa Rica, for instance, imports more forest products than it exports, although its forests are in large part still in a virgin condition, outside of the densely populated areas.

However, the rest of the world can ignore this situation in the tropical forest regions only so long as forests elsewhere are plentiful and productive enough to supply not only Costa Rica but any other country's demand for cheap lumber. The picture is now changing, since the northern countries have had to realize that their forest wealth is not inexhaustible. They will have to preserve their resources, economize, plan, and limit their own requirements, in order to meet all present and future needs.

Sometimes the term "forest products" when used in its broadest sense may include such cultivated items as rubber, gums, cinchona, vegetable oils, etc. In Puerto Rico even coffee in certain respects is included in this category. It may be added that it is to the advantage of certain of these products to have forestry principles of cultivation, rather than agricultural ones, applied to them. However, in view of the fact that the rotations of these types of crops are very short, they have not been included in this discussion, so that, for the purposes of this article, the term "forest products" is used in its narrower sense to embrace only the more permanent forest crops.

Dangers to Tropical Forests

Perhaps the greatest dangers to tropical forests are fire and shifting cultivation, which are often underestimated by investigators. Frequently these are complementary. A flight by airplane over tropical forests readily demonstrates the catastrophic influence of such factors. It is to be hoped that all responsible governments will recognize this effect and take requisite action. A proper conception of the amount of damage already caused by these two factors can only be obtained by aerial surveys on countrywide scales. Indeed, international co-operation in respect to this will be essential. However, if one were to anticipate the findings of such a survey, there can be no doubt about the fact that the tropical forest areas are diminishing. It is obvious, therefore, that from an international point of view, one of the worst results of the present crisis would be for the wood-producing countries of the Northern Hemisphere to try to ease their own situation by producing only for internal consumption. By so doing, the pressure on the tropical forests would be increased and the process of deterioration accelerated. It would be optimistic, indeed, to suppose that in a few years the tropical regions would be able, wholly unaided, to develop those principles and practices of scientific forestry it took Western civilization centuries to evolve.

Hence, the logical solution appears to be to hasten the application of the principles of sound forest management in the tropics, thereby preserving their forests for permanent use, supplying the forest products needed for the internal consumption of tropical countries, and at the same time offering the surplus of forest products for export, in order to ease the pressure on the forests of the Northern Hemisphere and to assist in their rehabilitation.

Tropical Forest Production

It has been pointed out that the timber balance of the European countries from 1927 to 1929 was based on a productive area of about 1.35 million km^2 of forests and that during that period a total yearly surplus of about 30 million m^3 of raw wood was available for export to non-European countries.[5] For the years 1928-29, Egon Glesinger[6] had put the normal production of timber and firewood for Northern Europe, excluding the U.S.S.R., at 231.62 million m^3, but estimated that actual output was 253.11 million m^3 and total consumption was 255.69 million m^3. However, even if the exact production capacity of European forests is debatable, the efficiency of modern forest management remains undisputed. It should be possible to produce enormous quantities of forest products from the tropical forests which make up half the forest area of the whole world, and which cover more than ten times the productive area of European forests. At present, a large number of these forests are not only lying idle, but are being destroyed and their products burned. Only when tropical forests have become self-supporting will measures for their protection become a serious possibility. It would be unrealistic to suppose that financial backing for the development of such forests would be provided from altruistic motives. There is no better description for this whole development than the French phrase "la mise en valeur des forêts tropicales." It implies not only their utilization but also putting them to good use, making this tremendous resource profitable and

[2]International Institute of Agriculture, *International Yearbook of Forestry Statistics*, Vol. III: *Africa* (Rome, 1942).

[3]*Intersylva*, *op. cit.*, p. 545.

[4]*The Forests of Costa Rica*, a general report made by the Forest Service of the United States Department of Agriculture in co-operation with the office of the Co-ordinator of Inter-American Affairs, Washington, November 1943.

[5]*Silvae Orbis*, Monographs of the International Forestry Center, No. 6 [German] or No. 6a [French] (1942), p. 1.

[6]Egon Glesinger, *Le Bois en Europe* (Paris, 1932), p. 127.

ensuring an adequate return for the money invested. The project is also vast enough not only to offer inducement for the investment of the great amount of capital needed but also to provide well-paid, rewarding work and to help improve the present labor conditions in the tropics.

As a rule, the working of tropical forests has differed very much from logging operations in the coniferous forests of the Northern Hemisphere. While these latter operations resulted in cutting the whole crop, tropical forests were generally logged only for special timbers of the largest sizes. On the Ivory Coast of Africa, where Aubréville estimates a total volume of 400 m^3 of logs and 200 m^3 firewood per hectare, the logging took only one white mahogany, *Entandrophragma laplaei*, on 10 to 22 hectares; one aboudikro, *Entandrophragma cylindricum*, on 10 to 24 hectares; one dibetou, *Lovoa klaineana*, on 8 to 14 hectares; and one bosse, *Guarea cedrata*, on 4 to 16 hectares. The splendid forests of Central America, with hundreds of different species of wood, are often worked for mahogany alone, as the other species are not considered marketable. The trees to be logged in many tropical forests are so scattered that the woodsmen trying to locate them are even called "mahogany hunters" or "snakewood hunters," as the case may be.

The conclusion reached by foresters after research in tropical forests is that eventually, with very few exceptions, a use can be found for every species. At the present time, modern logging methods are already being used in working mahogany in Central America. However, unless practically the whole stand of salable sizes can be cut in one sustained operation, it is unreasonable to expect cheap lumber from the tropics.

Frederick C. Simmons[7] complains that "in the United States . . . . a lot of logging is done with one specific product or the needs of one specific plant in mind, instead of taking out all the useful timber products ready for harvest in one operation . . . Each successive operation had to repair or build roads, bridges, camps, and recruit and supervise a new crew. This method of logging cannot help but bring about high costs."

The difficulties referred to are evident and are multiplied a great many times in numerous forests of the tropics. Unless a market can be found for many insufficiently known species, economical use of modern logging machinery is impossible and exploitation means the retention of slave labor methods no better than those of Pharaoh's time and will result as well in very expensive wood.

Study of Tropical Woods

Consequently, the first prerequisite for an increased utilization of tropical forests is a better knowledge of tropical woods. An outstanding amount of work has already been done in this respect. The current literature on the subject listed in the Yale University School of Forestry publication, *Tropical Woods*, is just one example. Investigation is more often than not carried out in search of a substitute for high-priced timber. It should rather be the other way round. Research should be broadened and start by ascertaining the composition of the stands in a forest and the uses to which the timbers could be put. Consideration of these uses should not be limited to specialty products such as wood for airplanes, ships, decks, etc., but should include ordinary lumber required for making houses, furniture, and packing cases and for the numerous purposes of modern wood technology.

Such research in itself is already a tremendous undertaking. Tropical forestry cannot but be thankful for the work done on tropical timbers by the great Forest Products Laboratories of the Northern Hemisphere. However, the investigations needed along the lines indicated are not being undertaken according to a general plan. The Northern research institutes were set up to examine their own forest problems and this primary objective keeps them more than fully occupied.

Before the war, the tropical forest experiment stations had their programs, each for its own region, but the Caribbean Forest Experiment Station in Puerto Rico is perhaps the only one whose development will not have been fundamentally modified by war and postwar difficulties. Even if the war had not occurred, the machinery and organization for tropical forest research would not have been sufficient from an over-all point of view.

There is need in the tropics for several forest products laboratories. It would be idle to suppose that private enterprise will be able to fill this need. Tropical forests are continuing to offer great advantages to the businessman with vision and capital. The timber trade is very conservative, however, and no one who has ever had any connection with the marketing of new timber species can imagine that this proposition would offer the same inducements to the investment of capital as would oil, minerals, or even rubber and other plantation products.

There are good reasons for the Northern Hemisphere Forest Products Laboratories to consider expanding their activities to include tropical forests. They have done so in some cases but mostly through the accident of circumstance. The forest policy of timber-producing countries of the Northern Hemisphere is no longer self-contained but will have to be correlated more and more with the development of the forests of the tropics. Co-ordination of research on tropical woods and forest products is therefore of world-wide interest.

If a general plan for the international co-ordination of tropical forest research or, more generally, of the investigation of tropical forest resources, should be agreed upon, there is one point that would require particular attention. The number of species in tropical forests greatly exceeds those in the temperate forests, and the same necessity which already exists in the north, of comprising several botanical species under one name in the timber trade, assumes great importance. Furthermore, the variability of many tropical timbers is very great. For example, the specific gravity of balsa, *Ochroma lagopus*, varies from 0.08 to 0.48, that is, in a relation of 1 to 6. The question of nomenclature and grading are both very much more important and complicated than is ordinarily realized. The anatomy and taxonomy of tropical trees is indispensable for tropical forestry, but it is futile to imagine that identification by a small sample of wood will be sufficient to establish the value of a log or a shipment of the same species. The timber trade will, quite correctly, value a well-graded shipment of mixed

[7] Frederick C. Simmons, *Recent Developments in Logging in the Northeast*, Northeastern Forest Experiment Station, Forest Products Paper No. 7 (January 1946).

botanical origin more highly than a shipment of only one of the component species which had been graded without proper attention to technical requirements.

With figured furniture or veneer woods, the botanical identity will hardly be questioned by the trade. A timber merchant will pay very much more for a beautifully figured log of one of the numerous "false" mahoganies than for a plain log of established pedigree. That merchant, however, will require microscopic scientific evidence if he wishes to evade an onerous contract. The unreliability of the trade in many tropical timbers is intensified by the phenomenal complication of indigenous names, different names being applied in neighboring areas to the same timber and the same name to quite dissimilar timbers. Even with scientific names the confusion, though less, still exists. With the best of intentions some botanical descriptions have been concocted from samples of leaves, flowers, and fruits of what subsequently proved to be different species. In the forests of Java and Surinam research workers affixed numbers on selected trees and these were visited at different seasons by collectors. Also, members of different native tribes were asked to identify and name these selected trees at different seasons. In this way, authentic material for herbarium and wood collections was obtained from authentic individual trees, remaining at known places in the forest and available for re-examination and control. Meanwhile, from this list, a dictionary of indigenous and scientific names was developed. Controlled work of collectors can be used to make descriptions of trees, supplying a satisfactory basis for diagnoses of botanical identity.

The great importance of the individual tree has been shown very clearly in Scandinavian research on the selection of *masurbirch* (wavy-grained birch) and other forest trees. The numbering of selected mother-trees in the tropical forest could lead, perhaps, in a few human generations to an improvement of the stock that would seem hardly credible now.

Trees of historical or poetic significance are preserved with pride in all countries. In some cases these trees might be of botanical or silvicultural interest. It would be little trouble and might prove of value in forest research to suggest that in every country of the world at least five full-grown trees of every indigenous species should be durably marked with a number plate and preserved for scientific purposes. Lists of these numbered trees with full particulars of the scientific data obtained from them should be supplied to the international forestry institution, that is, to FAO's Division of Forestry and Forest Products.

Conclusions

The realization of an expanding economy and higher living standards necessitates the development of the tropical forests.

At the present time the imports of timber and of other forest products into the tropics exceeds the exports, thus making the tropics a drain on the forest resources of the northern countries.

Efficient forest management could change the tropical forests into a very valuable asset, offering an attractive investment opportunity for much capital and work for large numbers of people. This management, however, cannot be realized if the tropical forests cannot be made to pay. The working of these forests is at present greatly restricted because only a few kinds of trees, useful for specialty purposes, are taken from most stands. A market has to be found for numerous kinds of timbers whose qualities are insufficiently known.

The forest situation of the northern countries renders this research a matter which interests the whole world. The northern forest research institutes have already done much work on tropical timbers. This work has to be broadened and brought under a comprehensive plan.

It is advocated that every country should mark and conserve for scientific research at least five full-grown trees of each species indigenous to that country.

Shipping logs by boat from Nicaragua.

Latin-American Forestry

Travel notes of two officers of the Division of Forestry and Forest Products

THE forest resources of Latin America are very great, and the large areas of undeveloped timber present a wonderful opportunity for improving the economic welfare and the living conditions of the people. In their efforts to achieve this improvement, the Latin-American countries can profit from the experience of other nations which have already faced similar situations. There, many regions with vast forest areas need to realize, if they have not already done so, that such a resource is not inexhaustible; that carelessness with fire and shifting cultivation must be replaced by careful husbandry and silviculture under the guidance of trained forestry technicians; and that the people generally must be helped to understand the meaning of conservation so they will support the efforts of both government and private industry.

There is a rapidly growing interest in Latin America in diagnosing these problems and in finding the proper solutions. Many of these countries have problems in common, and because some have already had experience in solving them, there is a real opportunity and, in fact, a need for an international approach to meeting their conservation and forestry requirements. The Food and Agriculture Organization of the United Nations is in a key position to provide assistance in the combined efforts of Latin-American countries in forestry development and conservation.

These are the impressions gathered by two officers of the Division of Forestry and Forest Products on a trip through the countries of Latin America during the months of April, May, and June 1947. Their impressions are based on conversations with government officials, educators, loggers, lumber producers, tradesmen, exporters, labor union officers and members, and especially with technicians in forestry, agriculture, and engineering. Such impressions are further based on inspections of logging operations in the jungles and in the mountains, sawmills, veneer and plywood factories, pulp and paper mills, research work at experiment stations, and field work in nurseries and forest plantations.

Status of Basic Knowledge

Forest Resources

Most of South America and a large part of Central America are made up of forested countries. In many cases an important part of the economy is dependent upon the exploitation of high value timber species. Knowledge of the extent of these resources varies considerably by countries. Chile, for example, has completed a very comprehensive inventory of its forest resources, listing the forest area, its volume, its species composition, and to a considerable extent its industrial possibilities. Guatemala and Colombia are making forest inventories. In British Guiana detailed reconnaissance surveys have been made of the most accessible parts of Crown forest land which can be exploited within the next 25 years. In most of the other countries there is very little knowledge of the forest resources except from the results of botanical expeditions which in some cases have described the forest vegetation, and in other instances have actually made estimates of the numbers of trees of certain high value species, such as mahogany, Spanish cedar, and balsa. The general state of knowledge is such that considerably more work will have to be done to permit the rational exploitation of the forest resources.

Although laboratories and technological institutions have tested a great number of timbers in order to establish their characteristics and their possibilities of industrial utilization, a considerable amount of work still remains to be done. Many species are unknown or unfamiliar although they undoubtedly have commercial value. Often they are not bought for the simple reason that their local name is unfamiliar to the buyer. We have seen in the same country the same wood known by five or six different names.

Knowledge of the ownership of forest land lags far behind that of farm land in most countries. The distribution of ownership among the national government, state and local governments, and private individuals is not at all clear with regard to forest land. In several countries this presents the problem of obtaining clear title before proceeding with cutting operations. Such information is also essential in the formulation of land-use plans designed to ensure that land which is suitable for agriculture should be devoted to that purpose and that land which is unsuitable to agriculture should be devoted to forest production.

This lack of knowledge as to ownership and suitability of forest land is reflected in the appreciation or lack of appreciation of the importance of forests for watershed protection, soil erosion control, and other important influences of the forest. This lack of appreciation in turn has resulted, as in many parts of the world, in unwise clearing of land for agriculture on highly erodable soils, in careless use of fire with consequent heavy damage to timber, grass, and vegetation in general and, in fact, has rendered unusable many thousands of acres of land which are so essential to the well-being of the rural population. This is especially aggravating in countries with high densities of population, as in the case of Haiti, Puerto Rico, El Salvador, and part of Venezuela.

Quebracho tree, the base of an important tannin industry in Argentina.

One of the great surprises to the visiting forester is the realization of the importance of reforestation problems. Thoughtless exploitation of the forests coupled with overgrazing has endangered soil stability and watersheds and has further brought about a serious timber shortage in some of the larger cities because the timber resources in the vicinity have been exhausted and the vast forests the country may still possess are so inaccessible as to be useless for the satisfaction of immediate needs. Fire, whether accidental or deliberate, is a further cause of deforestation.

Forest Industries

In a number of countries the government agencies concerned with agriculture and forest industry have started to assemble information as to wood requirements, present production of sawmills and wood-using plants, and the possibilities for domestic and foreign markets for forest products. Such studies have been made in Chile, the Dominican Republic, and Puerto Rico, but for the most part such information is not available. A number of countries are beginning to appreciate the value of such data as a basis for plans for expansion of their forest industries. The governments are beginning to realize that the forest resources can make an important contribution to badly needed foreign exchange and for this reason are initiating statistical services to put together such information.

In their efforts to get data both on forest resources and on forest industries, governments are confronted with the serious problem of an insufficient number of trained technicians to do the job. Fortunately, there is an increased awareness on the part of many governments of the importance of providing special training for promising young men by sending them abroad for additional schooling and then placing them in responsible positions upon their return. Such young men will need all the help they can get from fellow technicians in other countries and from international organizations such as FAO.

Government Interest and Action

Policy and Legislation

Most government officials consulted during the course of these tours expressed interest in forestry and felt quite optimistic about the possibilities of their government's translating this interest into definite action. Countries such as Mexico and Brazil—and to a lesser extent others as well — already have clearly stated policies as to public interest in their forest resources, and this has been followed up by specific legislation or forestry codes to regulate the methods of exploitation. Unfortunately in some instances, decrees and laws already on the books are not observed by the people and a serious effort will have to be made by the governments to educate the people to the need for such legislation. In some instances laws are not enforced because of lack of an adequate staff. Most countries expressed interest in receiving advice from FAO as to the basic principles which conservation legislation should cover.

Education

In recent years some governments have begun to include conservation teachings in the elementary schools. Much of this education is needed if the new generation is to improve on the methods followed by its parents and grandparents. There is a growing interest in education in general and, as more schools are constructed and more teachers become available, the inclusion of conservation in at least the primary grades should prove of real benefit in the conservation of soil, water, and forests.

Some efforts are made, as in the case of Argentina, to educate the general public to be careful with fire. In other countries, through the national parks and forests system, the general public learns to appreciate the value of forests. There are also a number of private associations which are interested in promoting conservation and there is a growing interest in this type of activity. This is, of course, a long-time undertaking, but fortunately many countries have made a start.

The most serious need in the field of education in practically all countries is that of trained technicians, as mentioned above. There are few formal forestry training centers in Central or South America. In many countries agricultural colleges train agronomists and provide courses in dendrology and wood technology to equip the young men to carry on the work in government forestry service. Recently, however, as in the case of the University of Buenos Aires in Argentina and the University of Rio de Janeiro in Brazil, government technical foresters, in addition to their regular duties, have begun to give formal forestry courses to students who are interested in becoming foresters. At the present time, however, most of the forestry technicians have been trained abroad,

principally in the United States of America and in some cases in Germany, Italy, or Sweden. There is considerable interest in establishing local forestry schools. Cuba already has a forestry school and Chile has the beginning of such a school at Victoria. The universities at Buenos Aires and Rio de Janeiro could be expanded to grant forestry degrees. Until that is done, however, most countries will probably wish to continue to send increasing numbers of young men abroad.

A slightly different type of education is in the planning stage at the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. Here efforts will center on developing vocational training in forestry to prepare students for general ranger type of work and for logging and sawmill operations, as distinct from the technical or professional training discussed above. It is understood that Venezuela plans to send a group of students to Turrialba very shortly for such training in vocational agriculture and forestry. A similar type of vocational school was started recently at Temuco, Chile, for Chilean students; and a somewhat related vocational school is in operation at Iquitos, Peru.

Education of all types obviously requires considerable money and some of the more forward-looking private companies, as is the case in Chile and Argentina, are sending young men abroad for training, with the understanding that they will return to work for the company. There are also a number of scholarships available for training in agriculture and forestry between the United States and Latin-American countries. The governments are, in general, anxious to take advantage of these scholarships by selecting young men who will agree to devote themselves to government service for specified lengths of time following the completion of their schooling.

There is considerable interest in building up libraries of technical forestry literature, especially at the local training centers. Such an effort should be encouraged in every possible way by FAO, aided by professional and scientific organizations in all countries.

Forestry Services

The status of government forestry services has fluctuated considerably in the Latin American countries with the interest of different administrations. There have been several cases in the past, where forestry services were built up by one administration, only to be dissolved by the succeeding administration. Fortunately, the interest expressed in such work by most government officials during the course of these tours gives promise of a more stable future for forestry services in these countries. In some countries, of course, there are no forestry services and this is especially sad in those countries where the forest could, if properly serviced, make a real contribution to the economy of the country. Both Argentina and Brazil have comparatively large staffs in their forestry services but have only a limited number of trained foresters among them. In other countries the small handful of trained technicians are divided among several ministries, whose functions with regard to forestry are not closely correlated. There is need, therefore, as expressed by many government officials, for reorganization of such forestry services, and in bringing together the forestry talent in such countries. Where public forest land has been formally set aside as national or state forests, the chief function of the forestry service is to properly administer such land. In some cases, as in Puerto Rico, British Guiana, and Surinam, the foresters are responsible for methods of cutting on the concessions granted to private operators. In other places their function is merely to measure the volume of products removed as a basis for revenue collection. In most cases, however, the staff is not even sufficient to perform this function and the control of cutting on public land is not at all satisfactory, in the estimation of the local foresters.

Forestry Research

Research in forestry as a government activity has not progressed very far in most countries. In British Guiana and Trinidad wood samples have been collected for identification and testing, and studies have been carried out in planting and silviculture. In Argentina some work has been started in forest plantation research and a considerable amount of work has already been done in wood technology. In Brazil samples of wood have been tested at the Institute of Technology at São Paulo and some experimental work is under way in reforestation of Parana pine. In Puerto Rico, the Tropical Forest Experiment Station carries on work in reforestation, silviculture, and forest inventory. Plans are being made in several countries, notably in Argentina, Chile, and Colombia, for large-scale research programs. In Peru an agricul-

A view of the Nahuel Huapi region, Argentina. The trees are Nothofagus *sp.*

A magnificent mahogany tree in southern Mexico. These trees are widely scattered throughout the forest, but often there is not more than one of this size to every two hectares.

tural experiment station has been set up for this purpose at Tingo Maria. This station includes work in forest nursery and plantation methods, and in growing cinchona. Similar arrangements are in their formative stages in Bolivia.

In the various countries, consultation service given by the forestry staffs to private owners and operators has not been developed to any great extent until now. There is an interest in this type of work and several governments have stated that they have plans to increase their forestry staffs to make this possible. A number of operators in the wood-using industry feel that such help would be extremely useful, especially in their sawmill and lumber-drying problems. In British Guiana, for example, it is hoped to employ a sawmill specialist to advise local sawmill operators.

The problem of protection from fire, insects, and disease receives varying amounts of attention in different countries. Fortunately, forest insects and diseases have not been of epidemic proportions in any of the countries visited, but fire is a very serious problem. This is especially true in Chile, where fires are said to destroy over three and one-half times as much timber as is cut annually for forest products. In other cases the shifting agriculture which involves periodic clearing with the use of fire results in serious damage to forest stands. This is especially aggravated in Puerto Rico and parts of Central America.

The whole problem of land-use planning requires, as has been often said, a joint attack by agronomists, soil conservationists, engineers, and foresters. Too often such land-use improvement efforts have been planned and carried out without the advice of all concerned. Most forestry officials feel that they have something to contribute to such programs and have expressed the hope that in the future they will be consulted.

Private Initiative

In most countries sawmill operators have been content to purchase logs at the mill or on the river and have, therefore, not been concerned with logging operations or reconnaissance work. Exceptions to this are found in Brazil, Chile, and Colombia, where sawmill operators hold title to the timber or to the forest land and carry on logging operations. Such operations in all countries could be planned more economically if reconnaissance information were available. In Chile at the present time such reconnaissance cruises are being made as a basis for new sawmill and logging installations. During the period 1941-45 the U. S. Government co-operated with Latin-American countries in sending out trained technicians to locate potential sources of critically needed species such as balsa and cinchona. More of this kind of work would pay for itself if private industry could obtain the trained technicians.

Road and trail construction is a very serious problem which is beginning to receive attention in such countries as Peru and Bolivia.

Logging has in most cases been done without regard to the future productivity of the forest land. In the case of Parana pine in Brazil, for example, trees have been cut to a 30 or 35 cm. diameter limit which in many instances amounted to clear-cutting. In the Amazon Basin logging has been highly selective, merely removing the occasional mahogany and cedar trees, in some instances only three to five per hectare. In parts of Chile the hand and ox logging methods have necessitated a type of selective cutting which leaves the trees that are too large for handling. Where mechanized logging has been used, the timber has been

Long greenheart logs, British Guiana, hewn square to facilitate removal from the forest.

Area in Chile laid waste by forest fires, which destroy more than three times as much timber as the country uses annually.

clear-cut and considerable damage has been done to young growth. But there is need for guidance to private industries on proper logging methods to prevent injury to young trees and especially to avoid serious damage to watersheds. Primitive hand-labor methods, especially in the Amazon Basin, but also in Surinam and British Guiana, have necessitated the wasteful hand-squaring and -tapering of the log ends with the result that much valuable wood is left in the forest. Also, the removal of the highly valuable species has resulted in "creaming" the stands so that the less valuable species remaining cannot be relogged as profitably as if the original operations had harvested all merchantable species. Mechanical logging equipment, in view of the all too common shortage of labor, is badly needed in practically all countries.

Most of the sawmill installations throughout Latin America contain antiquated machinery. There are some circular saws which produce better lumber at a faster rate but with greater waste. Throughout most of Latin America the need for fuelwood has provided a ready market for slabs and other sawmill waste. There has been a growing interest in the installation of edgers and trimmers but there is still a great need for this type of equipment. In a number of installations on the West Coast of South America, lumber companies merely resaw and dress Douglas fir timbers from the United States or Araucaria pine from Chile. There are very few dry kilns and considerable information is wanted as to air-drying and kiln-drying procedures. New sawmill equipment is urgently needed and there is a ready market for manufacturers who can promise early delivery.

There are a number of plywood plants in Argentina, Brazil, Chile, and Mexico which produce considerable material for local consumption. In most cases cold press methods with casein glue are used. Some new modern plants are in operation or are about to be installed, especially in Brazil and Chile. The advice of plywood and glue technicians would be very helpful in many of these places. Pulp and paper mills in Argentina, Brazil, and Chile are quite modern, and [illegible] trained technicians have been employed in most [illegible] stances. There is considerable interest in chemical conversion plants, and plans have been made in several countries, notably Chile, for such installations.

Trade Associations and Labor Unions

The wood-using industries in most countries have not been organized into trade associations. Exceptions to this are found among the Parana pine producers in Brazil and in British Guiana, but there is much room for such organization to standardize dimensions and grades of practically all types of forest products.

Labor organization is increasing in many countries, especially in Chile. The timber workers, however, have not been organized to the same extent as mining and transportation workers. Most of the organizations are made up of sawmill and plywood plant employees; logging and forest workers are less numerous. The trade union movement has been most developed in Chile, Mexico, and Venezuela and to a lesser extent, in Argentina and Brazil. In British Guiana the Timber Workers Union was responsible for negotiating improved wage scales and working conditions.

Special Programs

A new development in several countries, notably Bolivia, Chile, Colombia, Peru, Puerto Rico, and Venezuela, has been the setting up of *Corporaciones de Fomento* as independent government agencies answering directly to the Presidents of the countries. These organizations have their own funds or are able to borrow funds from local or foreign banks and from international organizations to finance the planning, construction, and operation of all types of agricul-

Wood for matches in Chile. The logs are cut from alamo trees, Populus nigra italica.

Point tipped logs are brought in by ox-cart to a sawmill in Costa Rica.

The old method of hauling logs on an ox-drawn sled in British Honduras. In a few places mechanical equipment has displaced such primitive methods.

tural and industrial enterprises. The main purpose is to initiate new industries and, in some cases, to provide for the ultimate ownership and operation by private capital. For the most part the officials of such corporations are aggressive, young technicians and give great promise of important expansion of forest industries.

In recent years the Office of Foreign Agricultural Relations of the U. S. Department of Agriculture has begun co-operative research and extension programs in collaboration with a number of countries with the objective of training Latin-American research workers to carry on the work of the experiment stations which it establishes. There are such establishments in several countries including Bolivia, Brazil, Costa Rica, and Peru. Their programs are principally on agricultural crops, but they do have an interest in forestry research as well and hope to expand this kind of work.

The Inter-American Institute of Agricultural Sciences of Turrialba, Costa Rica, which is supported by most Latin-American countries, carries on agricultural research and hopes to develop a vocational and technical forestry training program as well as forestry research work.

The Caribbean Commission is made up of France, the Netherlands, the United Kingdom, and the United States—the countries having possessions in the Caribbean area. The Commission seeks to promote interchange of technical information and research facilities between the possessions and has invited the independent republics in the Caribbean to participate.

Above: *Filing a pit-saw in Trinidad. With this two-man saw boards are still made from hewn logs.*

Below: *Oak bark being peeled with machetes near the Pan American highway in Costa Rica. Samples of the bark are sent to a U. S. laboratory to be tested for tannin content.*

Log deck of a modern sawmill in Honduras.

The Pan American Union is performing a valuable function in acting as a clearing-house for information among the Latin-American Republics and is much interested, among other things, in conservation and improvement in the fields of agriculture and forestry. Its officials in agriculture and conservation services have been helpful to FAO in promoting its work and FAO avails itself on this occasion to gratefully acknowledge their assistance.

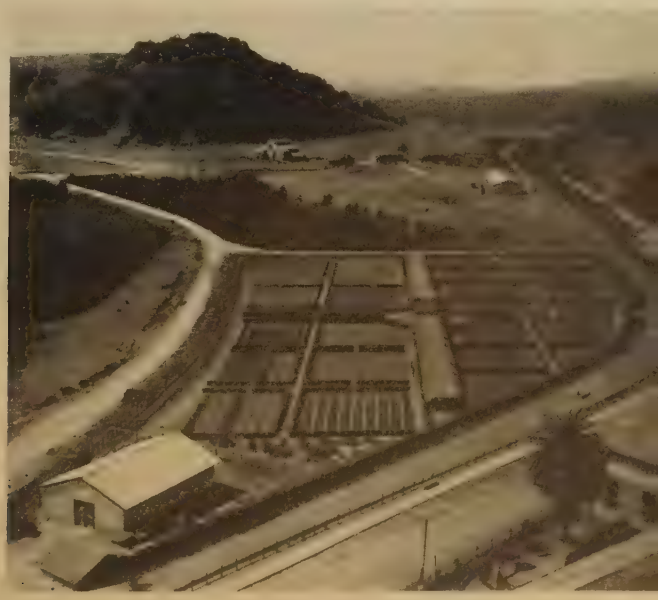
As a result of the interest of a number of South American countries and of the efforts of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), a program of research and education is being formulated for the Amazon Basin by the Hylean Amazon Institute.

There are also a number of organizations interested in carrying on special expeditions of exploration in Latin America. These include the New York Botanical Gardens and Yale University which are conducting expeditions into British Guiana and Surinam to collect and identify forest, and other, vegetation.

It is clear that the solution to many of the problems mentioned above will require more than the efforts of each country working by itself. An international approach and collaboration among the countries interested is essential. The International Conference for Forestry and Forest Products for Latin America will have to define clearly the problems. Later, when the FAO Latin-American regional office is established, it will be able to assist in studying those problems which the countries themselves, at the conference, will have decided are most urgent and most widespread. The forthcoming conference, therefore, holds the key to the future work of FAO in Latin-American forestry and conservation.

Above: *A small sawmill town in Chile, dependent upon the surrounding forested hillsides. The permanence of such a community depends on carefully planned sustained-yield operation.*

Below: *This well-organized nursery in Chile provides planting stock for farms and cut-over lands.*



Photos accompanying this article were furnished by courtesy of Victor Bianchi and Eduardo Torricelli, Department of Forests, Chile; U. S. Forest Service; Argentine Embassy; Tom Gill; "The Military Engineer" and the Co-ordinator for Inter-American Affairs.

Remains of an oak forest, which formerly protected an important watershed in Costa Rica. Formerly forested slopes in the background are now merely poor pasture, in places eroded to bare rock.

Latin-American Timber, Ltd.

By WILLIAM VOGT

EVERY sector of the human race enjoys—or suffers from—its own superstitions. There are few superstitions as deeply grounded as the belief that Latin America is rich in timber resources. True, the region between the Río Grande (Río Bravo) and Cape Horn includes one of the greatest remaining extensions of forest. It is equally true that much of this forest could be turned into marketable and usable timber; millions of hectares have already been cut and burned, with costly results to the Latin-American nations. Yet, continuation of the policy—or lack of policy—that has characterized cutting, down to the present, may well prove to be a disaster. It is important that the belief concerning Latin America's timber endowment be critically examined.

Development of ecological understanding, in this fifth decade of the twentieth century, has brought us to an increasing realization that we may only rarely, with justification, think of a stand of trees merely in terms of timber. While we may consider the trees as timber, we must also, in most parts of the world, evaluate their relationship to the total environment—as watershed protection, wildlife habitat, stabilizers of soil, etc.; and in a world of mounting population pressures, where new uses for wood are constantly being discovered, consideration of forest resources is meaningless except in terms of their relationship to human societies. The tendency, characteristic not only of Latin America but of most of the world, to look at an area of trees and think of it in terms of one of these isolated factors is, in the light of modern science, indefensible. Both theoretically and in actuality, the significance of any tree is a function (in the mathematical sense) of its environment. Its commercial value may be determined by transportation facilities, inflation 10,000 miles away, or a war on another continent; its social value—not only distinct from, but at times opposed to, its cash value—will certainly be governed by slope, rainfall, soils, the total supply of trees, esthetic considerations, the human beings using it directly or indirectly, etc.[1]

These are not philosophical or academic "verbalizations." They are harsh facts that affect the well-being and even the survival probabilities of millions of men, women, and children around the earth.

Most environments are complex; that of Latin America is almost infinitely so. Through the intricacy that is the Latin-American forest, there run three brilliantly colored strands.

The first of these is a dynamic, and often violent, geography. Most of Latin America lies within the tropics. This immediately implies high temperatures, intense rainfall, and nearly as intense desiccation. Destruction of the forest cover, with exposure of the soil to the open sky, raises the average maximum temperature by as much as 17° C.[2] and to the full impact of rains that, in Costa Rica, reach 2,800 millimeters a month.[3] The intense heat of the sun accelerates oxidation to such a point that land that once supported a rich tropical forest may, within a decade, lose its capacity to support more than an impoverished scrub. Concentrated rains leach out minerals and, though the accumulation of humus may produce fine crops for a few years, exposure to rainfall rapidly destroys the productive capacity.

High temperatures and driving rains, in part because of their maleficent influence on agriculture and in part because of the fact that they create ideal conditions for the existence of such human diseases as dysenteries, malaria, schistosomiasis, etc., raise the environmental resistance against human occupation. This tends to concentrate human beings above the 700-meter altitude. Here the farmer is usually forced to cultivate slopes (often in excess of 45 degrees) and soil erosion rapidly gains control.

Except for the Argentine pampas, unexcelled in richness, Latin America possesses little level land within the temperate zone, except in high, intermontane valleys, which are of course sharply limited in extent. Level, noneroding lands, apart from these areas, consist almost entirely of areas with deficient precipitation, as in Patagonia and northeastern Brazil, or expanses such as the Amazon Valley and Venezuela's *llanos*, which suffer tropical climatic limitations. For most of Latin America's land there is no crop so well suited as trees.

The stringently limiting factors of the tropical lowlands and semiarid areas have had an influence on the distribution of human populations, the danger of which is only beginning to be realized. Latin America may be said to face the problem, within its own borders, of at least 20 million and probably 40 million displaced persons, a dilemma that makes the solution of the European D. P. problem seem like child's play. These tens of millions are displaced not in a political sense, but in an ecological sense. They are concentrated on sloping lands, the cultivation of which, under our present economic system, can result only in rapid, and in many cases permanent, destruction of the means of subsistence. They are able to grow their own food, and fibers for clothing and other purposes, and to supply the needs of growing cities, only by a process of autophagy. Economists who exult in increased "production" from such lands are blind to the fact that the people living on them exist by a perversion of the Prometheus myth: They may enjoy a

[1] Alfred Korzybski *Science and Sanity* (second edition. Lancaster, Pennsylvania Science Press, 1941)

[2] Jean-Paul Harroy, *Afrique, terre qui meurt* (Brussels: Marcel Hayez, 1944).

[3] Personal communication from Carlos Lankester.

An area in Costa Rica formerly forested with trees like these is being converted to pasture. As a result, the rivers below are filled with silt and, in the dry season, many cattle die of thirst.

rich meal, but it is on their own liver that they are feeding.

A second predominant strand in the tangled environment is rooted deep in the aboriginal past. It is the ancient custom of the *milpa*, or shifting agriculture. Utilized by primitive peoples throughout the world, especially in the tropics, it has served well under primitive conditions. The forest was cut and burned, cultivated for a brief period until its fertility fell below a productive level, and then abandoned—for periods as long as 30 or 40 years—while vegetation re-established itself, once more built up a humus cap, and in part restored fertility. The tropical forest is a closed system that, drawing carbon dioxide and water from the air, sustains itself; once the cycle is broken, it falls apart.

With the increase of populations throughout Latin America and with improved markets for foodstuffs, it is no longer possible to rest the land for a sufficiently long period to restore it. There is simply not enough land that can be farmed. As a result, the period of fallowing has been diminished, the ultimate tribute is wrung from the soil, and hillsides are falling into the rivers. Millions of hectares have been so devastated by this maltreatment that it is improbable they will be restored to productivity within the lifetime of men now living.

The means of adapting human use to the limitations imposed by natural laws, and of escaping from the abuse of the aboriginal pattern, lies of course within the province of modern science. But here we encounter a third dominant influence in the complex—the tradition of centralized government, brought to the New World from the Iberian peninsula. In most Latin American countries, which have to adjust themselves to the new economic patterns of a technological world, the interest of the government and the availability of its services are still in many cases directly proportional to the proximity to one or two large cities. "Back country" is often considered primarily in terms of exploitation. Road systems are developed for access to the capital, rather than for development of the provinces. Health, educational, and other facilities that build up a region and make it acceptable to settlers are again usually concentrated in the capital city and one or two satellites. Forest areas usually lie far from centers of governmental activity and as a result are not always at the forefront of attention.

This condition results in part from the low carrying capacity of much of Latin America's land. The Venezuelan *llanos*, the Ceará district of Brazil, the *selva* of Peru, the Guanacaste plains of Costa Rica, etc., like large areas of Arizona, New Mexico, and the western Dakotas in the United States, have such a low carrying capacity (are able to produce so little wealth) per square kilometer, that they are unable to support large enough aggregates of people to justify the maintenance of modern schools, hospitals, water and sewerage systems, roads, and motion picture theaters—the amenities that we consider part of the modern high standard of living. This explains, to a considerable extent, the concentration of populations in the large cities. Whereas roads have been built in some parts of the world to open up new territories, their effect in much if not most of Latin America has been to siphon people off the land into the large towns. A powerful contributing factor in bringing this about is the urban background of the Spanish culture, which attaches the highest value to activities concerned with existence in cities. The "hick" or country bumpkin, while he may be a social inferior in the Anglo-Saxon culture, is regarded with even less esteem in the Latin-American culture. Even the trained agronomist and forester are inclined to feel that, once they have graduated from a technical school, they should take on a desk job and spend most of their time in town.

What have these factors to do with the Latin-American forestry situation? They have combined with many other factors, such as the virtual absence of pure stands, to develop a social pattern in relation to available forest areas that makes consideration of Latin-American forest resources, in a European or North American term of reference, completely invalid. Forest utilization in Latin America must be approached with a mind free from preconceptions.

In terms of slope, climate, favorable temperatures, soils, etc., only about 5 percent[4] of South America's land can, in the terms of modern western civilization, be considered arable. (Were lowland areas, particularly along river bottoms, to be opened to a water-buffalo and rice culture such as obtains in Asia, and such as is being advocated by Asiatic leaders faced with the problem of excessive populations, the prob-

[4]Frank A. Pearson and Floyd A. Harper. *The World's Hunger* (Ithaca, New York: Cornell University Press, 1945).

lem of arable land would be entirely different.) A very high proportion of this 5 percent is adjacent to rivers. In few parts of the world is agriculture, the basis of existence of the vast majority of the Latin-American people, so immediately associated with the hydrologic regime, and in no part of the world is the hydrologic regime balanced on so delicate an equilibrium, so vulnerable to disturbance. The ecology of Latin America, like that of Africa and tropical Asia, is peculiarly difficult to live with. Latin America, from Mexico to southern Chile, has been gravely wounded by disturbance of the hydrologic regime, primarily as a result of deforestation. Poverty has been extended, living standards lowered, and some countries brought to the brink of starvation, through lack of proper use of forests. Nine years of study of Latin-American ecology have convinced me that there is no factor more important to the future well-being of this great area with its rapidly increasing population of 150 million people than a healthy relationship among human populations, forests, and water.

Let us consider what this relationship has been, in some sample countries:

Deforestation for purposes of mining had become such an obvious threat in the 1540's that the native Mexicans in the region of Taxco petitioned Viceroy Mendoza to protect their lands and their wood supply by forest regulation. The earliest forestry laws of the New World were promulgated in a decree by the Viceroy in February 1550;[5] many features of them could still be considered sound forestry. One has only to look at the landscape around Taxco today, seamed and pitted like the face of a dissipated old man, to realize that whatever may have been done in 1550, the Viceroy's wisdom had little effect. Hillsides have been stripped not only of their forests but of their soil. Streams that once ran steadily throughout the year are now intermittent, alternating between flood and disappearance. Springs have vanished. Much of the land has been turned into a virtually unproductive waste.

What is true of the Taxco region is more painfully true of many other parts of the Mexican uplands. Here, over hundreds of thousands of square kilometers, land that once produced rich coniferous forests —and that today could be the source of an enormous income to Mexico—has lost not only its trees but its topsoil. Where it once produced great pines, it can now scarcely support the maguey cactus.

Obviously this soil has had to go somewhere. It has washed into hundreds of lakes, hydroelectric and other reservoirs, stock ponds, and rivers. Infertile silt has covered valuable lands downstream. River beds have been elevated by silt, and rivers forced to seek new courses. Coastal swamps have been extended.

Without the forest to break the fall of the rain and without its roots to hold the soil in place, erosion has been accelerated probably more than 100 times. Without the humus layer to absorb the rain and let it sink into the water table, the rate of run-off has been speeded up. No survey is available, but it is certain that thousands of springs that once fed human populations and contributed their slow clear trickle to the streams have disappeared. Man has turned hundreds of thousands of square kilometers into an ecological desert, for the sake of a quick and profitable crop of trees, a few years of corn and potato production, and grazing. He has reduced the productive capacity of this land to the vanishing point. Even in the time of Cortés, there were protests over his wanton cutting of trees for urban construction.[6] The destruction has continued, at least into 1947, when President Alemán sharply restricted the cutting of timber on state-owned lands.

Many of the remaining Mexican upland forests are in an unhealthy condition. Virtually uncontrolled fires and grazing have destroyed the forest complex and replaced the normal, reproductive understory by park-like expanses of grass, of low carrying capacity. In some areas, such as the national parks near Mexico City, where I estimated the age of the trees to be 60 to 80 years, there is literally no reproduction. Were all grazing to be excluded immediately, and were 100 percent-effective fire protection organized, there is in these forests no possible way in which Mexico can close the gap between maturing trees and replacement.

The slopes of this mountain in Costa Rica have been deforested, and gullies are cut through rich land by uncontrolled run-off. A town was destroyed here. Deforestation of upper slopes for maize fields is threatening rich coffee lands below.

Largely as a result of de-vegetation, water tables are falling in Mexico (as they are in many countries) and there are few towns of any size that are not faced with the threat, or the actuality, of water shortage. Like the North Americans, the Mexicans are trying to go farther and farther afield, at increasing cost, for their water supplies. They are not aware of the fallacy of the position in the United States and of the failure to realize that subsurface water is limited and can be replaced only by infiltration of water that falls from the sky. Indeed, the North American destruction of watershed capacity is being generally repeated throughout Latin America.

As one might expect, with the increased rate of run-

[5] *Boletin del Archivo General de la Nación* (Mexico), Vol. II, pp. 260-263.

[6] Lesley B. Simpson, *Many Mexicos* (second edition, New York: G. P. Putnam's Sons, 1946).

off, flood hazards mount. In the latter part of 1944, some 300 people were drowned in the Mexican lowlands in floods that for the most part originated on deforested slopes.[7]

Mexico's great wealth of pure or nearly pure stands of conifers, found in the uplands, has been at the same time Mexico's liability. Clear-cutting has been profitable in the absence of an adequately developed forest management policy, and not only forests but the total land complex and social environment have suffered. Mexico's lowland forests in Yucatan, Tehuantepec, etc., have been largely protected from exploitation, up to the present time, by their mixed character. True, certain valuable woods have been cut over wide areas, and the *milpa*, driven forward by increasing population pressures, has caused large tracts to be burned. Conversations with lumbermen indicate that a new danger is arising — that of clear-cutting. As large areas of tropical forest are cut off, particularly where they grow on the porous soils of Yucatan, we must expect a profound ecological change that will once more turn great areas into desert or near-desert. Here, as in so much of tropical America, we may see in operation the land degeneration so vividly described by Harroy for Africa.[8]

As we move south into Guatemala, we find an even more serious situation than that found in Mexico. The population pressure, relative to areas of arable land, is far higher in this beautiful republic. Cornfields have been pushed up such steep hillsides that they are commonly said to be planted with shotguns! In many parts of the highlands one may see areas where the cutting of the vegetation has brought about such a change in the angle of repose of the soil that entire hillsides have collapsed into the valley below. The *milpa* system is again dominant here. As a result, at the end of the dry season of 1945 smoke was so thick, in the region of Atitlán, that photography was impossible. Standley[9] reports that some Indian communities in Guatemala, for want of fuel, cannot cook their unleavened corncakes (*tortillas*) but must content themselves with a thick cornmeal mush.

This raises one of the major forestry problems of Latin America: how to supply sufficient cordwood and charcoal. At least 75 million people depend on these fuels for all their cooking, heating, and in many cases industrial, purposes. Railroads depending on wood from mountainsides through which they run, have spread devastation over thousands of square kilometers. In the Urubamba Valley of Peru, for example, the railroad has been largely responsible for tearing down the mountainsides. In Brazil, firewood for the locomotives is in some cases trucked as many as 152 kilometers, because of extensive deforestation.[10] Smelting is still carried on with charcoal in a number of countries, as it was in the sixteenth century.

It is probable that no single crop in Latin America is as important as firewood. Yet it is probably safe to say that no Latin-American country produces it on a sustained-yield basis, i.e., grows as much as it cuts. If only to repair the damage caused by charcoal burners, whose ovens are one of the chief causes of forest fires, the maintenance of extensive research programs and forestry schools would be justified in both human and monetary terms. Such facilities will have to be created.

El Salvador, without coal or petroleum, with little to export except coffee (with an annual value of $15 to $20 [U. S.] per capita), and with barely adequate hydroelectric resources in the rainy season and a serious lack of electric power in the dry season, is rapidly approaching the fuel-less condition of the Guatemalans described by Standley. Two million people, increasing at the rate of 40,000 per year, are crowded into 13,000 square kilometers, with only about a million hectares of arable land at their disposal.

The need for more land is acute; this drives people up the hillsides, where they plant corn on 100-percent slopes. Under such conditions and without control measures such as the expensive stone terraces of the ancient Incas or the modern Javanese, it is literally impossible to hold the soil in place. The need for fuel under such conditions is inevitably becoming more acute. Here, also, springs are disappearing. For some years there has been under consideration a plan to develop a counterpart of the Tennessee Valley Authority (TVA) on the Río Lempa, which rises in Guatemala and crosses El Salvador. This would require complete de-population of the precipitous slopes above the river, and it raises the problem as to where the population could be resettled. So much silt is dumped into the river from the nearly vertical cornfields that any dams constructed would be turned into silt traps within a very short time. On 28 August 1946, the Lempa was carrying a silt load equivalent to 170,208 metric tons per day![11]

The northern border of El Salvador, adjacent to Honduras, where the town of Ocotepeque was wiped out a few years ago by a flood resulting from deforestation, is dissected with hundreds of eroded gullies that are often 15 or 20 meters deep. They are dumping their sterile subsoil into the country's short rivers, whose flash floods, spreading this sand on the good lands downstream, are a cause of great national concern. One of the cardinal needs in El Salvador today is a vast reforestation program that will restore the country's lands to the use to which they are best suited, that will stop gullying, and that will bring under control the waters which, when unregulated, are one of man's most dangerous enemies.

Costa Rica possesses the considerable advantage of a small population in relation to its productive area. Nevertheless, as in Mexico, it has concentrated its people in the salubrious and productive highlands, where lands that should never have been de-vegetated have been planted to corn and coffee—with the expected result. Costa Rica possesses some extremely interesting forestry problems and, in a sense, epitomizes some of the difficulties of Latin-American forestry. She possesses, for example, magnificent stands of the *copeyi* oak. This appears to have been unknown to foresters and lumber dealers alike until a route was sought for the Inter-American Highway. Since the opening up of the forest, destruction has been almost without

[7] William Vogt, *Mexican Natural Resources—Their Past, Present, and Future*. Report on Activities of the Conservation Section, Division of Agricultural Co-operation, Pan American Union, 1943-1946 (Washington: Pan American Union, June 1946).

[8] Harroy, *op. cit.*

[9] Paul B. Standley, "The Forests of Guatemala," *Tropical Woods*, 67, 1941.

[10] M. L. Cooke, *Brazil on the March* (New York: Whittlesey House, 1944).

[11] W. C. Bourne, T. W. McKinley, C. P. Stevens, and M. Pacheco, *Preliminary Survey of Conservation Possibilities in El Salvador* (San Salvador: Servicio Cooperativo Interamericano de Salud Pública, 1947).

Hundreds of gullies cut up the soil in El Salvador. The arrow points to one of the maize fields that started the erosion.

limits.[12] Steep slopes are being stripped; some areas have been burned—though fortunately the humidity keeps down forest fires—and much of the area looks as though *Panzers* had passed over it.

This oak forest, one of the most magnificent stands of trees left in the Western Hemisphere, has been recommended as a national park, in order that its beauty and its scientific interest might be preserved, at least in part, for generations to come. Not only will unbridled destruction of the trees destroy a great cultural value; it will rapidly destroy the land. The rainfall in this area is about four meters per year. Soils are thin and sloping and cannot possibly produce many crops. Nearby areas, reported to have been cleared within 25 years, have degenerated into low-grade pastures in which bracken, *Pteris* sp., is the dominating plant. Much of the control of the waters that flow across the El General Valley, into which Costa Rica hopes to extend its agriculture, lies in this oak forest.

An uncomfortable object lesson in what destruction of this watershed may do, can be found on Costa Rica's Pacific coast and in the Province of Guanacaste. On the Pacific slope, most of the area occupied by man has degenerated into such low-grade pasture as was mentioned above. Here, rivers that might be an important source of hydroelectric power vary as much as 100 to 1 between the wet and dry seasons, largely as a result of deforestation. On the plains of Guanacaste, formerly covered at least in the southern extensions by tropical forest, rivers are so laden with silt that it has been necessary several times to move entire ports downstream, in order that they might continue accessible to boats. The rush of waters from the uplands floods so much of southern Guanacaste that cattle must be removed if they are not to drown. In the same regions, when attempts have been made to replace the forests with grassland, in the dry season the cattle die of thirst.

This disturbance of the hydrologic regime has taken place under relatively primitive conditions. The headwaters of the Guanacaste rivers have scarcely felt the lumberman's ax and the farmer's torch. As the Inter American Highway is opened up across these watersheds and, in the absence of controls, the forest is wiped out, much of Guanacaste, the seat of Costa Rica's important cattle industry, will be made uninhabitable.

In central Costa Rica, the region around San Ramón is approaching that of the maguey lands of Mexico, as a result of deforestation and subsequent soil erosion. The hydroelectric reservoir of the town of Heredia has lost approximately 75 percent of its storage capacity—despite constant attempts to clean out the silt—because of the destruction of forests and the sowing of corn on its watersheds.

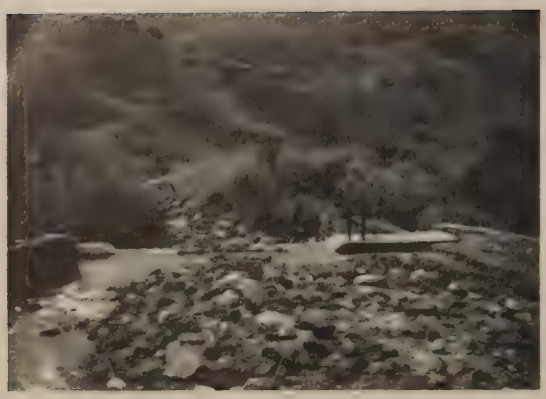
Costa Rica still possesses large areas of forests. As one considers them and the potential wealth locked up in them, one cannot help asking whether they are more important to this richly endowed little country as a source of immediate wealth, in the form of marketable timber, or as regulators of the waters on Costa Rica's hillsides. A policy and techniques of sustained-yield lumbering will have to be developed for this country, since it would not be worth while, for the money a single crop of trees will bring, to turn thousands of kilometers into a desert.

A forester of broad experience in Venezuela is the authority for the statement that approximately half of its trees of high timber value have already been cut. Whether or not this estimate is sound, Venezuela's hydrologic regime—it is no exaggeration to say—has been wrecked by de-vegetation of the Andean slopes that dominate the country. In some of the other more heavily populated nations, destruction of the land is more widespread; in no country that I know are the dynamics of land destruction more violent.

Here, once more, we find the familiar pattern, with 70 percent of the country's population crowded into

Rivers in Costa Rica are accumulating so much silt that ports have to be moved, or abandoned.

[12] William Vogt, *The Population of Costa Rica and Its Natural Resources* (Washington: Pan American Union, July 1946).



A single Venezuelan storm fills this power reservoir with detritus from the deforested Andean slopes above.

13 percent of its area that comprises highlands. A clue to the effect of this concentration is given by what might be called alluvial peneplains, which still survive in some of the highland valleys. These indicate that alluvial soil, once available for farming, formerly lay some hundred meters deep and provided broad, nearly level fields for food production. The slopes of the mountains, according to early travelers, were heavily forested. Deforestation subsequent to the arrival of the Spaniards accelerated run-off of rainwater (in some areas totalling about four meters a year), cut down through the alluvial deposits, and over an area of hundreds of kilometers carried the rich soil to the sea. Cornfields that were once a thousand or more meters across are now down to 20 or 30 meters. So much soil has been stripped from the slopes themselves that broad areas can no longer be cultivated. Some fields are producing no more than 0.1 to 0.2 quintals of wheat per hectare.[13]

Venezuelans now talk of the "anarchic" regime of their rivers, ignoring the fact that it is man, and not the rivers, that is anarchic. Soil brought down from the uplands has covered wide expanses of level lowland and has raised river beds. Streams, the flow of which was once regulated by the tropical forest, now alternate between flash floods and periods of near-dryness. As river beds are raised by upland soil, they must seek new outlets. They lash slowly to and fro, like the tail of an angry tiger. The town of Garcitas, on Lake Maracaibo, has already been destroyed by the Río Chama. The important port town of Santa Bárbara is threatened with inundation by the Chama and the Río Zulia, which are slowly drawing together.

Across the Andes, hundreds of rivers dump millions of tons of rainwater onto the *llanos*, which are alternately flooded and desiccated. It is reported that 15,000 cattle were drowned year before last in the region of San Fernando de Apure alone. This important state capital is every year isolated for weeks or months by the uncontrolled floods from the uplands.

A clue to the destructiveness of these unleashed waters is given by hydroelectric stations. That at Valera has a settling tank 2.5 x 15 x 20 meters, with an intake of 2.5 x 1.5 meters. So much silt enters this tank in the rainy season that it must be cleaned out daily. Despite this, so much silt passes into the penstocks that turbine blades must be replaced every few months. Heroic attempts are made to clear detritus out of one of the power reservoirs of the city of San Cristóbal; but erosion on its watershed is so violent that the reservoir is sometimes filled almost to capacity with rocks and sand after a single storm.

Control of erosion, provided human beings can be controlled, may be possible in the Venezuelan Andes by means of grasses. Destruction of humus, with its power of water retention, is, however, so widespread and so complete that restoration of forests as a means of flood control may well require decades. When the imperative of slow rebuilding through inevitable plant successions is set against a social background in which shifting agriculture and burning are commonplace and in which human populations are rapidly increasing, it is possible to gain some idea of the difficulty of the task that lies before the forester. It is an unfortunate, unpalatable, and inevitable fact that most of Venezuela's uplands should have been kept under forest and never cultivated. Venezuela faces no problem more difficult or immediate than the resettlement of 1 to 2 million people, whose disregard of limiting factors on the uplands is making survival on the lowlands difficult, if not impossible. Not all of the Andean forest in Venezuela has been cut; but the exploitation is proceeding rapidly, as roads make the forests available. Much of the area should never have been logged, even on the basis of selective cutting. Here is another environment in which the felling of a single tree may so disturb the angle of repose of the soil that a landslide will follow.

The coastal region of Peru consists of almost unbroken desert. The eastern slope of its mountain chain, again characterized by rain forest with level land almost nonexistent, is again subject to the limitations we have described. Until recently, it has been cheaper for residents of Lima to purchase Oregon pine than the products of their forests. If no adequate forest policy is developed, it may still be preferable — in terms of Peru's survival — to import lumber from abroad.

As we move southward into Chile, we escape from the limiting high temperatures of the tropics. But as we travel south of Santiago into the famous zone of the "Roaring Forties," we must again face the problem of driving rainstorms. Forest exploitation in south central Chile has already taken tragic toll. Thousands of hectares that should have been maintained in trees have been cleared and the land planted to wheat. Soil exhaustion, erosion, and a fall in yields (see table) is a tendency that is all too widespread. A sample will suffice to show the situation.[14]

Osorno, the principal city of south Chile, was formerly a port, but siltation resulting from forest destruction has long since isolated it from the sea. Corral, at present the outstanding port in the south of Chile, is threatened with a similar fate. Aysen, on Chile's frontier fringe, is nearly isolated by silt washed into the fjord by which it is approached.

Chile has actively enlarged its program of timber

[13] William Vogt, *The Population of Venezuela and Its Natural Resources* (Washington: Pan American Union, December 1946).

[14] Manuel Elgueta G. and Juan Jirkal H., "Erosión de los Suelos de Chile," *Boletín Técnico Núm. 4* (Santiago de Chile: Departamento de Genética y Fitotecnia, Ministerio de Agricultura, Enero 1943).

Period	Yield of Wheat							
	Cauquenes	Chanco	Quirihue	Florida	Mulchén	Traiguén	Imperial	Collipulli
	(quintals per hectare*)							
1911-1917	8.7	9.7	7.7	11.2	10.3	11.3	12.0	13.4
1918-1924	8.6	7.2	—	—	9.9	11.1	12 6	9.9
1925-1931	8.0	6.8	7.3	7.3	8.0	10.1	10.9	8.8
1932-1939	5.9	4.7	4.8	6.7	7.7	10.2	9.9	7.2

*A quintal equals one hundred-weight.

cutting and foresters are wont to refer to this as an increase of "production." If the cutting, however, is not being done on a selective, sustained-yield basis and there is no adequate provision for reforestation, it would seem more accurate to translate "production" into "destruction." Many of south Chile's forests grow on such thin soil and such sloping land that a single cutting results in erosion that strips the soil to bedrock. Over much of the Huaitecas archipelago, for example, there is little probability of more than one crop of trees. The same situation obtains, of course, in the Northern Hemisphere, on the Archean shield, where a single cutting, especially if it be followed by fire, leaves the hilltops naked.

Not all the forests of Latin America occur on vulnerable slopes. Millions of hectares, particularly in the Amazon Basin and coastal plains, are distributed over level or near-level land. These forests, of course, do not exist in pure stands and relatively little is known about the utility of most of the trees in them. Exploitation that will be both economically and ecologically sound will require far more research than has yet been undertaken. That vast riches are locked within these forests—riches that can be safely harvested only on the basis of rational exploitation—seems highly probable. Here lies a great frontier, intellectual as well as geographic. A co-ordinated research program, internationally financed, would seem to be one of the most promising investments for the governments of the wood-hungry world.

Not all the forests on the sloping lands should be left intact—not by any means. However, any plan for their exploitation should give full weight to the many influential and complex factors involved, some of which were mentioned above. It does not seem unreasonable to insist that any program of timber utilization on sloping lands be weighed in the balance of its effect on the land itself—and on the well-being not only of downstream populations but those that, in this expanding world, may be expected to occupy the lower reaches of the watersheds within the next hundred years.

CONCLUSIONS

Drawn from the Preceding Article by the Staff of FAO's Forestry and Forest Products Division

A widespread process, such as that so vividly described by Mr. Vogt, clearly calls for thorough study and the strict application of remedial and curative measures.

Responsibility lies, of course, with individual governments, who should accept this as being in their own national interests.

It is well to emphasize that broadly similar critical problems of forest and water-shed deterioration have occurred elsewhere and that, by aggressive planned action, they have been controlled. A simple outline of the kinds of measures which have been effective elsewhere may serve to indicate that the job ahead in Latin America, though formidable, is not incapable of solution.

(1) In the first place, a policy to halt the further spread of shifting cultivation on erodable, sloping land must be formally adopted. Whether control is to be exerted through establishing reserve forests, through zoning, or in some other way, is immaterial. Control in the general interest is the cardinal point. Similarly, deciding what types of administrative mechanism should be set up is far less important than that there should immediately be an authority to reach and enforce decisions, after proper study of the facts in each particular situation. Experience has shown that a decisive policy and an effective administrative authority can halt the process of degradation. To check any further increase in avoidable damage is clearly the first step.

(2) The complex task of restoring damaged and destroyed forests and water-sheds next needs attention. It seems clear that fire must be controlled. Whether resulting from land clearing, as a supposed aid to grazing, from lumbering, or from accident, fire aggravates the ill effects of shifting cultivation and sets back the natural processes of regeneration. A clear-cut policy and adequate legislation must be made operative by a field organization with the requisite authority to check traditional practices. Experience in many lands has shown that, given determination, such a program can be carried out.

(3) It is essential that felling of timber should be carried out with caution so that cut-over areas may still support forests and will not suffer from erosion. Methods will vary with different types of forest. The main objective is to halt the spread of barren land. Especially for public forest land, this implies an active field force of trained foresters for applying proper forestry practices. Such a body must have adequate legal powers and administrative authority.

(4) Once shifting cultivation and fire have been brought under control, positive action must be taken to encourage and accelerate restoration of the forest

cover. Where natural restocking by useful species is likely to be long delayed, planting of suitable species will often be indicated.

In any event, extensive and costly reforestation programs are desirable only after substantial control of primary destructive forces has been achieved. The same applies to various direct methods of controlling active erosion and floods through soil conservation practices, combining engineering and forestry. Although these methods are expensive, a number of Latin-American countries will have to use them, in view of the situation described by Mr. Vogt. In fact, when a stage has been reached where slopes can no longer retain top soil, the establishment of vegetation is impossible until stability has been restored to the soil. Specialists must determine where these costly projects, which include drainage, trenching, dams, and retaining walls, should be carried out so as to obtain the best results. In most cases, this will be up in the watersheds as this is where streams and torrents gather momentum to cause floods and from where eroded soils are carried down to silt rivers and cause deltas.

Two very important and difficult programs must parallel the positive action suggested above. The first entails informing and educating the people directly concerned as to why they should change their traditional ways of using land and as to the benefits they will derive. Public support is always essential when such changes are planned. Methods of reaching the people are well-known but, of course, must be adapted to particular populations.

The second program entails creating a solid basis for the practice of forestry, proper land use, soil conservation, and flood control through a great deal of research and experiment. General principles and effective methods nearly always need to be adapted to local forest and soil conditions. Local research is therefore necessary.

In sum, then, Mr. Vogt's article points to the proper development of land use, forestry, and soil and water conservation as being major problems for Latin America. They present, however, a great opportunity and challenge to the determination of Latin-American governments and peoples.

Photos accompanying this article were furnished by courtesy of Marjorie W. Vogt and William Vogt.

Consumption and Production of Paper and Paperboard in the Twenty Latin-American Republics, 1935-46[1]

By the Staff of the Division of Forestry and Forest Products

DURING the period 1935-46 the consumption of wood pulp products increased more than 30 per cent in the twenty Latin-American Republics. Since the level of imports remained relatively constant, the increased consumption was accounted for by increased domestic production. It is an interesting fact, too, that though the absolute level of consumption increased, the increases slightly more than kept pace with the population growth.

Assuming that the immediate past can be used as an indication of the immediate future, if there are further appreciable increases in consumption they will probably be the result of increased domestic production, both of wood pulp and of pulp products. It is suggested that as the level of consumption rises to and remains at a sufficient degree to support pulp product industries, such industries will be established. The forest resources of Latin America are rich and the knowledge of how best to utilize them is slowly being gained.

CONSUMPTION

At the present time the consumption of paper, paperboard, and converted paper products in all Latin America is on a relatively low level, varying from 6.0 to 6.6 kilograms per caput over the period 1935-46. Although these figures are higher than the estimated averages for the Middle East, Africa, or Asia, they are considerably lower than the 1937 estimate of 17 kilograms and the 1946 estimate of 25 kilograms per caput for Europe, the 56 and 40 kilograms per caput consumption for the same years in Australia, or the record average of approximately 107 and 143 kilograms per caput in the United States.

As shown in Table 1, there is considerable variation among Latin-American countries in the use of paper and paperboard, Argentina having the highest per caput consumption (19 kg. in 1945-46) and six countries having less than 1 kg. It is significant that for the twenty republics as a whole, per caput consumption has been steadily, if slowly, rising. Despite the fact that several countries have been forced recently to limit importations of paper, there is strong evidence pointing toward a continued increase in per caput consumption.

[1]The data used in this study were obtained mainly from the following sources: *World Paper Consumption, 1927-1938*, (U. S. Dept. of Comm., Bur. of For. and Dom. Comm., May 1941); *Pulp and Paper Trade Statistics of the Other American Republics, 1938-1941* (U. S. Dept. of Comm., Bur. of For. and Dom. Comm., 1944); *Industrial Reference Service, Part 6: Forest Products* (U. S. Dept. of Comm., Bur. of For. and Dom. Comm., various releases between 1944 and 1947). Population estimates were taken from: *Monthly Bulletin of Statistics* (Statistical Office of the United Nations, July 1947, No. 7). Latin-American 1945 and 1946 imports, except for a few instances where official statistics were at hand, were assumed to be approximately equal to Canadian, United States, Swedish, Finnish, and Norwegian exports to these destinations.

TABLE 1.—ESTIMATED CONSUMPTION OF PAPER, PAPERBOARD, AND CONVERTED PAPER PRODUCTS IN LATIN AMERICA

Country	Consumption			Consumption per Caput[1]		
	1935-37 Average	1939-41 Average	1945-46 Average	1935-37 Average	1939-41 Average	1945-46 Average
	(*Thousand metric tons*)			(*Kilograms per caput*)		
Argentina	290	302	273	23	23	19
Bolivia	2	3	2	0.6	0.9	0.5
Brazil	144	167	212	3.7	4.1	4.6
Chile	35	46	53	7.6	9.8	9.8
Colombia	17	23	25	2.0	2.6	2.5
Costa Rica	2	2	2	3.0	3.1	2.7
Cuba	42	63	70	10.1	14.8	14.6
Dominican Republic	n.a.	2	3	n.a.	1.2	1.5
Ecuador	1	4	3	*	1.4	0.9
Guatemala	2	3	2	0.7	1.0	0.6
Haiti	n.a.	0.3	1	n.a.	*	*
Honduras	1	2	1	*	*	*
Mexico	90	100	176	4.8	5.2	7.9
Nicaragua	1	1	1	*	*	*
Panama	n.a.	3	5	n.a.	5.0	7.4
Paraguay	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Peru	16	19	26	2.7	3.1	3.8
El Salvador	2	2	3	1.2	1.1	1.5
Uruguay	21	27	26	10.1	12.6	11.6
Venezuela	5	14	19	1.4	3.9	4.4
TOTAL OR AVERAGE	671	783	903	6.0	6.5	6.6

n.a. = Figures not available.

*The figures for consumption are not sufficiently accurate to justify the computation.

[1]In calculations of consumption per caput, the population data used were estimates for the years 1937, 1939, and 1945.

For all countries the estimated apparent average annual consumption[2] rose by 35 per cent between 1935-37 and 1945-46 (from 671,000 metric tons to 903,000 metric tons). It is noteworthy that during this period the amount of paper and paperboard imported remained almost at a constant level of a little more than 400,000 metric tons. Consequently the over-all increase in consumption was entirely accounted for by the principal paper- and paperboard-producing countries of Argentina, Brazil, Chile, Cuba, Mexico, Peru, Uruguay, and Venezuela.

It can be seen from Table 1 that between 1935-37 and 1939-41 consumption increased approximately 112,000 metric tons and between 1939-41 and 1945-46, 120,000 tons. Undoubtedly, if export supplies of paper had been available in greater quantities during 1945-46, the figures for apparent consumption during this period would have been considerably greater. For not only was it necessary for importers to meet demands for current consumption but they also had the problem of building up depleted inventories. During this period foreign exchange was generally available for the importation of paper and, in particular, of newsprint.

Requirements

The use of paper and paperboard products forms an essential, if unobtrusive, part of the total commodity consumption needs of a country. In Latin America, as the low per caput consumption figures prove, the use of paper has never been excessive and generally speaking has not been applied to luxury needs. The requirements of newspapers are urgent both because of the importance of world news and because of the larger numbers of readers resulting from increased educational facilities. Requirements for public and private documents, for elections, for the recording of vital statistics, for education, and for sanitary purposes are all on a level of highest essentiality. We generally fail to realize fully the quantity of paper and paperboard required for the packaging of food and industrial products, a need which will increase further with the advent of commercial shipments by air. In Latin America almost the total quantity of paper used by commercial businesses and by manufacturing enterprises can be considered essential. And at the present time, because of the shortages in tinplate for cans and in jute and cotton for bags, if multiwalled paper sacks were not available, some urgently needed sugar, cement, lime, and other commodities could not be safely moved.

The industrial developments which are continuing to take place in Brazil, Cuba, Colombia, Mexico, and other countries have been recorded in detail in many publications. With a knowledge that this industrialization has taken place, bringing with it new and significantly larger demands for paper and paperboard, it is surprising to note in Table 1 that, while total consumption has increased 120,000 metric tons between 1939-41 and 1945-46, per caput consumption just barely increased. In other words, consumption just kept pace with the growth in population. It is possible, of course, that the estimated increases in population may be slightly in error and, if the actual population increase is smaller, consumption per caput might be slightly larger. However, the possible changes involved would not be important. Because there has been no significant increase in the figures for per caput consumption, in spite of the known factors leading to increased demand, it is logical to assume that current consumption levels approximately represent essential needs, or the "hard core" of demand which cannot be greatly lowered without harm to the economy of the countries involved.

Consumption Related to Per Caput Income

Estimates have been made of the per caput income of all but one of the Latin-American countries.[3] Recognizing the approximate nature of the data, we have used them only as a means of securing a subdivision into two groups, one for countries having a relatively high per caput annual income (more than the equivalent of $100 per annum) and the other for countries having a low per caput annual income (less than $100). For these two groupings per caput paper and paperboard consumption has been determined.

Group	Per Caput Consumption of Paper and Paperboard		
	1935-37 Average	1939-41 Average	1945-46 Average
	(*Kilograms*)		
Average per caput income more than $100[1]	8.1	9.0	8.5
Average per caput income less than $100[2]	2.9	3.2	4.3

[1]Argentina, Brazil, Chile, Costa Rica, Cuba, Uruguay, and Venezuela.

[2]Bolivia, Colombia, Dominican Republic, Ecuador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Peru, and El Salvador.

It is not advisable, with the data available, to attempt to relate the consumption of paper and paperboard products with variations in per caput income. It is sufficient to demonstrate that there is a marked relationship between per caput income and per caput paper consumption. We can safely say that where there has been a rise in the per caput income, as has happened in Mexico, for example, there will be a corresponding rise in per caput paper consumption. We would ordinarily expect to find the largest increase in the per caput consumption group of the highest income grouping. This is not the case, for the figures show that in the immediate past per caput consumption of paper and paperboard has had the greatest increase in those countries where the income level was lowest. In part the explanation is undoubtedly due to an increase in income in these countries and its expenditure on paper and paper products in preference to other items.

Consumption Related to Literacy

In most countries of Latin America newsprint accounts for a considerable portion of the paper and paperboard consumption. For this reason it is inter-

[2]Apparent annual consumption has been taken to be domestic production plus imports. By using an average for two and three years the disturbing effect of advance purchasing and delayed deliveries has been minimized. In addition, fluctuations of consumption because of changes in business conditions have been reduced.

[3]*Basic Data on the Other American Republics* (Co-ordinator of Inter-American Affairs, Washington, D. C., late 1944), p. 171.

TABLE 2.—ESTIMATED CONSUMPTION OF NEWSPRINT IN LATIN AMERICA

Country	Newsprint Consumption			Relation to Total Paper and Paperboard Consumption		
	1935-37 Average	1939-41 Average	1945-46 Average	1935-37 Average	1939-41 Average	1945-46 Average
	(*Thousand metric tons*)			(*Percentage*)		
Argentina	155	141	90	53	47	33
Bolivia	1*	2*	1	50	67	50
Brazil	55	50	85	38	30	40
Chile	20*	19*	26	57	41	49
Colombia	6	7*	7	35	30	28
Costa Rica	1*	1	1	50	50	50
Cuba	13	15	19	31	24	27
Dominican Republic	n.a.	0.5	0.3	n.a.	25	10
Ecuador	1	2	2	n.a.	50	67
Guatemala	1	1	1	50	33	50
Haiti	n.a.	0.1	0.2	n.a.	33	20
Honduras	0.5	0.4	0.2	50	20	20
Mexico	25	31	57	28	31	32
Nicaragua	n.a.	0.5	0.2	n.a.	50	20
Panama	n.a.	2	3	n.a.	67	60
Paraguay	0.4	0.3	0.1	n.a.	n.a.	n.a.
Peru	8	10	10	50	53	38
El Salvador	1	2	2	50	100	67
Uruguay	12	12	14	57	44	54
Venezuela	0.8	4	5	16	29	26
TOTAL OR AVERAGE	301	301	323	45	38	36

n.a. = Figures not available.
*Includes some printing paper.

esting to determine the relative consumption of paper and paperboard when the countries are grouped in accordance with estimates of the rate of literacy.[4]

Group	Per Caput Consumption of Paper and Paperboard		
	1935-37 Average	1939-41 Average	1945-46 Average
	(*Kilograms*)		
Rate of literacy less than 50 percent	1.5	2.1	2.2
Rate of literacy more than 50 percent	7.6	8.3	8.4

The figures indicate that there is a definite relationship between the rate of literacy and the amount of paper and paperboard consumption. While it is true that the rate of literacy is related to per caput income levels, the figures show that paper consumption in the grouping of countries having a rate of literacy 50 per cent or higher has been from four to five times as great as the consumption in the other countries; in contrast, consumption in the grouping of countries having more than $100 per caput income was approximately two to three times the lower per caput income grouping. This indicates that the rate of literacy might well be the more important factor in paper consumption. As has been mentioned before, great strides are being made toward increasing the rate of literacy and one expected consequence will be the increased consumption of paper.

CONSUMPTION OF NEWSPRINT

Average annual consumption of newsprint in Latin America has varied from 45 per cent (1935-37) to 36 per cent (1945-46) of total paper and paperboard consumption.[5] Because of the world-wide shortage of newsprint it cannot be said that its relative decline in the consumption picture is due to the rising use of other paper and board products. In fact, while this actually accounts for the percentage decline during this period, it is very likely that, had the supplies been available, the use of newsprint would have maintained its relative place and perhaps would have increased.

In Latin America as in many other parts of the world, newsprint is used for many other purposes than for newspapers. Because of the fact that it is the least expensive paper, it is also used as a wrapping paper, as a printing paper, for school notebooks, etc. Because of the limited average income, newsprint must serve the needs of Latin-American consumers as a substitute for the higher priced papers they cannot at the time afford.

During the early thirties there was considerable international price competition in newsprint. With adequate foreign supplies available, the press in many countries opposed tariff barriers and this, together with the prospect of small profits and possible losses on the large capital requirements, presumably discouraged the growth of domestic newsprint mills. At the present time newsprint is manufactured in Argentina, Brazil, Chile, and Peru, but only in Brazil and Chile does domestic production constitute as much as approximately 40 per cent of domestic consumption. In Argentina production now accounts for about 6 per cent of present consumption and in Peru, 10 per cent. In Brazil domestic production of newsprint is expected to increase, as a new paper and pulp mill has begun production of newsprint.

Of particular interest is the considerable drop between 1941 and 1945-46 of newsprint consumption in Argentina (141,000 metric tons to about 90,000 tons). In part this may be accounted for by the fact that during the war Argentina's supply of newsprint from Northern Europe, its principal supplier, was limited, and Northern Europe has been unable to resume shipments on the prewar scale.

[4] *Loc. cit.*

[5] For comparison, in the United States in 1939 newsprint accounted for approximately 22% of total paper and paperboard consumption and in 1945, 17%.

Import Requirements

Aggregate average annual imports of approximately 400,000 metric tons of paper, paperboard, and converted paper products have not changed much during the time intervals under consideration. The principal grade of paper imported has been, and will continue to be, newsprint. It is estimated that during 1945-46 import requirements were distributed among the principal grades as follows:

Type of paper	Percentage
Newsprint	65
Book, printing, and writing papers	10
Paperboard, including boxes and cartons	9
Wrapping papers, including bags	6-7
Tissue and sanitary papers	4-5
Converted paper products	4-5
Other papers	2

The domestic paper-making industries are protected from foreign competition by import duties. This is not an unusual international practice. Paper products were among the first manufactured products receiving tariff protection in the United States. With tariff protection only that portion of a country's needs in excess of local production will be imported, except for qualities of paper which cannot be made profitably and for small quantities of paper imported for "prestige use."

In countries producing paper, there is a sizable demand for imported coated papers, check or safety paper, special bond papers, sanitary papers, and cellophane. There is a small demand for special industrial papers such as condenser tissue, abrasive paper backing, cable paper, etc. Import demands can be stimulated for such specialties not domestically produced as building papers, wet strength paper, the newly developed water and weather resistant containerboard, and converted paper products such as cups, towels, display paper, carbon paper, business forms, etc.

There is and will continue to be a market for high grade paper similar to that made domestically, particularly where the quality of the locally produced product does not approach the quality of imported papers, as for example in sanitary papers. Also, upon many occasions it will be desirable for business to use the best quality paper available, e.g., for letterheads, for invitations, for special editions of books, for legal documents, etc.

PRODUCTION

The production of paper in Latin America has been primarily from imported wood pulp. This is a natural consequence of a lack of favorably situated supplies of woods which are now economically profitable for conversion into wood pulp. Coniferous woods, from which most wood pulp in the world is made, are not available in Latin America in sufficient quantities or in sufficiently accessible localities. It is only recently that advances have been made in the manufacture of wood pulp from broad-leaved trees. However, little is known concerning economic conversion processes with respect to the species found in Latin America. While paper and paperboard are being made in Peru from bagasse, this method has not to date been adopted in other countries.

If the consumption of paper and paperboard continues to rise, it will become profitable for more countries to manufacture their own paper requirements. In time, given the demand for paper, many of the difficulties in pulping native woods will be adequately solved and we may expect an increase in the production of domestic wood pulp.

During the war, in almost every paper-producing country in Latin America there was a lack of high-grade raw materials. To extend the available supplies, lower grade materials such as waste paper and vegetable fiber pulp had to be used. In addition, it was not possible to get adequate supplies of desired repair parts or to secure better paper-making machinery. The fact that many of the paper machines in Latin America were no longer modern contributed to the lowering in quality of the paper produced. However, the need for paper was so great that all which could be produced was sold. The procurement of newer paper-making machines and the return to wood pulp of prewar quality should result in the production of better paper.

The increase in paper and paperboard consumption in Latin America as a whole is almost wholly accounted for by the increase in domestic production of the principal paper-making countries shown above. The growth of the industry during the past ten years is striking, aggregate production for the period 1945-46 being almost double production during 1935-37. Local production has more than kept pace with consumption. It is now estimated to equal more than half of total consumption, as contrasted to 38 percent of total consumption during 1935-37.

The production of paper and paperboard in the principal producing countries is even now still in the initial period of growth. Although Argentina, Brazil, and Mexico have been producing paper and paperboard for a considerable number of years, the paper-making mills in Chile, Cuba, Peru, Uruguay, and Venezuela were only established after 1930. The present period of growth appears to be strong and vigorous, and shows very little sign of diminishing. The in-

Table 3.—Estimated Production of Paper and Paperboard in Selected Latin-American Countries, 1935-46

Country	Production			Production as a Percentage of Consumption		
	1935-37 Average	1939-41 Average	1945-46 Average	1935-37 Average	1939-41 Average	1945-46 Average
	(*Thousand metric tons*)			(*Percentage*)		
Argentina	83	132	150	29	44	55
Brazil	87	110	150	60	66	71
Chile	26	34	37	57	74	70
Cuba	7	24	20	17	38	29
Mexico	46	51	92	51	51	52
Peru	1	5	14	6	26	54
Uruguay	2	9	9	10	33	35
Venezuela	1	6	6	20	43	32
Total or Average	247	371	478	38	50	56

creased growth of the industry has of course brought with it increased employment and increased pay rolls.

The following numbers of pulp and paper mills are listed for 1947:[6]

Argentina	21	Guatemala	1
Bolivia	1	Mexico	17
Brazil	45	Peru	3
Chile	10	Uruguay	4
Colombia	2	Venezuela	3
Cuba	3	TOTAL	110

The mills in Bolivia, Colombia, and Guatemala do not use imported wood pulp and presumably make paperboard from waste paper, used paperboard boxes, straw, and bagasse. Their annual production has not as yet been very great.

The war did not permit paper and pulp mills to put into effect all the plans which they may have made to modernize or to add to their plants. Operations, on the whole, were quite profitable, and it is said that many companies were able to set aside funds for improvements or additions to their plants. While specific details are known concerning some proposed plans for improvements and concerning plants actually completed and now in operation, the over-all picture since 1941 can best be summarized by Table 4, which shows exports of pulp and paper-making machinery and parts from the United States.

Machinery Imports

It should be kept in mind that the figures shown above include essential repair parts for day-to-day operations and that there have been marked increases in prices during 1945-46. Undoubtedly, however, the larger amounts shown in the table represent capital improvements in the form of purchase of new or used machinery, and these additions to capital investment have meant, or will mean, increased output capacity. These figures can be used as an approximate guide to the course of domestic production in 1947 and in 1948. Therefore, marked increases in production can be expected in Brazil, Chile, and Mexico. Moderate increases in production are likely to occur in Argentina, Cuba, and perhaps Venezuela.

TABLE 4.—UNITED STATES EXPORTS OF PULP AND PAPER MILL MACHINERY TO SELECTED COUNTRIES IN LATIN AMERICA, 1941-47

Country	1941	1942	1943	1944	1945	1946	1947 Jan.-July
	(*Thousand dollars*)						
Argentina	6	14	2	....	....	35	72
Brazil	268	507	565	220	395	646	481
Chile	39	24	18	25	57	126	106
Cuba	8	15	7	3	30	96	43
Mexico	251	117	174	163	711	966	911
Peru	76	86	28	51	25	11	13
Uruguay	1	3	10	....	4	4	6
Venezuela	2	6	12	6	1	37	27
TOTAL	$651	$772	$816	$468	$1223	$1921	$1659

The large shipments of pulp and paper machinery to Brazil, Mexico, and Peru during the years 1941-45 explain how it was possible for their paper and paperboard production to reach 1945-46 levels. In 1946 and in 1947 the record shows large shipments of machinery to Argentina, Brazil, Chile, Cuba, Mexico, and Venezuela. Since some of this machinery will create new wood pulp-producing facilities (As noted below, it is difficult to purchase wood pulp at present.), undoubtedly there will be an even greater increase in Latin-American paper and paperboard production.[7]

Outlook

Paper-making mills can be divided into two broad groupings: those which manufacture wood pulp which they themselves use to make paper (called integrated mills) and those which purchase the wood pulp (sometimes called market wood pulp) needed for their paper-making operations. At the present time there is a world shortage of wood pulp for sale and there is small prospect of supplies equalling demand in the immediate future. The lack of an assured source of supply of wood pulp is one of the major obstacles preventing the establishment of new nonintegrated paper mills. For this reason most new mills in Latin America will tend to be integrated paper mills unless they have been able to make stable arrangements for domestic or foreign wood pulp supplies.

Because of the large capital investment in a paper-making mill, it is customary to operate it 24 hours a day. Of course, lack of adequate supplies or lack of a market for its products may dictate another course of operations differing from those yielding a maximum return on investment. Therefore, if management cannot foresee a period of uninterrupted operations, it is likely to lay aside its plans for the erection of new mills.

As world economic conditions improve, there will continue to be a market for the important products which Latin America provides the world. Under such circumstances, industrialization will proceed at a rapid pace and Latin America will become a still greater market for the products of other nations. Industrialization, with respect to the paper industry, may mean that, except for newsprint, some day in the future many countries will be able to provide for their own needs. However, import needs for specialty and prestige products may be greatly expanded. Latin America's imports of paper-making machinery and parts, and of machinery for converted paper products, may very well exceed in value any possible decline in the value of paper imports.

Still further increases in capacity for paper making are right now in the process of being created. The outlook is for the utilization of this new capacity, at the expense of reduced imports if necessary, and a still further increase in consumption to keep pace at least with population growth. All the signs point toward increased per caput consumption. If immediate past history is repeated, expansion of domestic production will also take place.

Latin America has shown that it possesses the initiative to start new enterprises and has known how to obtain foreign capital and technical assistance when needed. It has a rich bounty of forest resources, and progress is being made insuring beneficial utilization. Under these circumstances the future growth of the pulp and paper industry appears assured.

[6] *Lockwood's Directory of the Paper and Allied Trades, 1947* (Lockwood Trade Journal Co., Inc.: New York 19, N. Y.)

[7] Of great interest is the exportation of kraft (sulphate) wood pulp by Mexico to the United States beginning in May 1947.

MEXICO
CUBA
HAITI
DOMINICAN REPUBLIC
JAMAICA
PUERTO RICO
BR HONDURAS
HONDURAS
GUATEMALA
EL SALVADOR
NICARAGUA
COSTA RICA
PANAMA
TRINIDAD
VENEZUELA
COLOMBIA
GUIANA
Br.
Neth.
Fr.
ECUADOR
PERU
BRAZIL
BOLIVIA
PARAGUAY
CHILE
ARGENTINA
URUGUAY

National Situations

In endeavoring to present a background of information for the International Forestry and Forest Products Conference for Latin America, it was thought useful to include a short summary of comparable data for each of the Latin-American countries. These summaries make no claim to be completely authoritative, since data were included only as available. They do present a condensed picture of conditions.

Argentina

Argentina has a total area of 280 million hectares and a population of over 15 million. The forested area, lying in general along the borders on the Chilean frontier and the regions bordering Brazil, Paraguay, and Uruguay, as well as in the far south, covers some 51 million hectares or 18 percent of the total land area. An estimate of the volume of timber in the nine territories indicates that there are a thousand million m^3 but the amount in the provinces has not been estimated. Forest land ownership varies by territories and provinces, but in general the government owns about one-third. Timber-cutting rights on government land are sold to private operators on bid.

Forest exploitation has not yet attained its full development. It is estimated, however, that one-third of the quebracho in the northern part of the country has already been cut. Exploitation in the *Misiones* in northeastern Argentina, the northwestern Andes and southern Patagonia has been on a very small scale although there are plans for increasing the cut in these areas.

A rough estimate of forest growth places the increment at 2 percent. Damage from forest fires has been extensive. A more accurate picture of the area, volume, growth, and condition of the forest will be obtained from an aerial survey which is now in progress and which should be completed within the next five or six years.

The Delta of the Río Parana and Río Uruguay contains some 40,000 hectares of willow and poplar plantations, and plans call for planting the remainder — over 400,000 hectares. There are also large-scale plans for windbreak, shelter-belt, and sand control in the dry areas of central Argentina.

Precise figures are not available as to domestic consumption of wood products, but it is known that demand is very great. Argentina has been importing 70 percent of the Parana pine produced in Brazil.

Although exact number and capacity of the sawmills in Argentina are not established, there are some 12 to 14 plywood mills and 21 pulp and paper mills. Railroad ties and mine timbers are hand-produced on a small scale. There are several tannin extract plants depending upon quebracho from northern Argentina.

Forestry work is now carried on by the government in both the Ministry of Agriculture and the Ministry of Lands. Under legislation now pending, both agencies are to be combined. This legislation also provides authorization and increased financial support for research and extension work. Considerable work has already been done in wood technology and dendrology, and the results have been published by the University of Buenos Aires and the Department of Forestry.

The University of Buenos Aires has offered courses in dendrology and wood technology to its agricultural students. Recently the technical staff of the government Department of Forestry has begun to give courses in all phases of forestry to some 20 to 40 students of "Silviculture and Horticulture." Agriculture, but not forestry, is taught at three other universities.

As regards forest management, it may be said that plantations are well handled through thinnings and improvement cuttings. However, old growth timber is not managed systematically on either public or private land. The Department of Forestry, however, is extending planned management work on public land, and pending legislation authorizes stricter control of exploitation on these lands.

A forest road in South Argentina. The trees are Librocedrus *and* Nothofagus *spp.*

Bolivia

Bolivia's area of 190 million hectares contains a population of 3.8 million. Eastern Bolivia, the principal forest area, is drained by the Amazon in the North and the Paraguay River in the South. The southeastern plains form part of the Gran Chaco. The highlands are made up of the western cordillera, the Altiplano, intermontane basins, and the eastern cordillera. One-third of the country is mountainous; two-thirds are lowland. Expansion of transportation facilities is hampered by rugged topography and scattered communities.

Fifty-two million hectares are estimated to be forested land, which is largely privately owned. Although no survey figures are available as yet, an estimate of the forest volume has been placed at over 990 million m^3.

It is clear that the demand for railroad ties, bridge timbers, and construction lumber for railroads and highways from Brazil and Argentina, and for projects of the *Corporación de Fomento* of Bolivia is much higher than local production. Housing construction in the cities requires wood for flooring and interior finish.

The wood-using industry is at the beginning of its development. There are several small private mills operating below capacity and a plywood plant whose principal product is citrus crate veneer. The *Corporación de Fomento* of Bolivia is now installing a number of sawmills with a daily capacity of 20 to 80 m^3 each.

There is, at present, no Forest Service. The Ministry of Agriculture, however, runs several forest nurseries which grow trees for farm windbreaks and for ornamental purposes.

The *Corporación de Fomento* of Bolivia has arranged for the testing of several timber species at São Paulo, Brazil.

Brazil

Brazil, with a total area of over 850 million hectares, has a population of over 46 million, 75 percent of which is concentrated within 160 km. of the coast. Forty-seven percent of the total area is covered with forests. In the Amazon Basin 362 million hectares are covered with tropical hardwoods. The Parana pine forest covers 8.8 million hectares. In addition, the rain forests on the Atlantic slopes in eastern Brazil are also an important source of timber. Forest products include logs, lumber, carnauba wax, palm oils, nuts, maté, and rubber.

Parana pine, *Araucaria brasiliana*, is the most important softwood timber species in South America. The present rate of cut is about 1 million m^3 per year. This is about one-third to one-half of present capacity of the 3,500 sawmills in the Parana pine region. Commercial stands average 79-86 m^3 per hectare, but vary from 49 in the lighter stands to 198, and there have been reports of small dense areas as high as 734 m^3 per hectare. Individual trees often yield three to five 5-meter logs with the lower two or three logs being practically clear. Cutting is limited to trees over 30 to 35 cm. in diameter. However, trees grow to 160 to 175 cm. diameter at breast height. Studies of growth rates have yet to be made but mature trees now being cut range from 100 to 200 years old. Plantation-grown pines have reached 40 cm. in diameter in 25 years.

The sawmills in the Parana pine region are powered 75 percent by steam, 20 percent by electricity, and 5 percent by water. The *Instituto Nacional do Pinho* has been regulating production in order to keep it in line with available railroad transportation facilities. Production was briefly reduced to 17 percent of capacity but is now up to 50-70 percent of capacity. The Institute carries on reforestation work on cut-over land. It has several projects on which it provides houses, schools, and medical facilities for families of laborers who fence the areas against hogs, clear out brush, plant pine seeds, and protect the plantations from fire. It has authority to enforce regulations as to cutting and regeneration by private owners. There are two large American-type sawmills that use railroad-logging methods. Most Parana pine mills, however, use hand-logging methods. Their development will depend on the installation of modern equipment. Most primary transportation of logs from stump to mill is done by trucks and road construction is being gradually extended, making truck-hauling more economical.

In the Amazon Basin the actual volume of tropical hardwoods available for exploitation is not known. Logging operations have been carried on within short distances of the rivers for a number of years. There have been numerous botanical expeditions in the Basin but no forest surveys have been made. The forests can be roughly divided into deciduous types and broad-leaved evergreen rain forests. The deciduous forests are from open to moderately dense, usually single-storied with thick underbrush, although in many places grass is abundant and layers of humus and litter are fairly deep. The valuable species are usually widely scattered, in many cases not over two per hectare. Abundant rainfall all the year round, sandy soils, and frequent floods characterize the rain forest area of the Basin. The forest itself is extremely dense with many areas of almost impenetrable undergrowth. The humus is very deep and there is usually no grass or vegetative cover under the trees, which vary from 60 to 300 cm. in diameter and reach heights up to 50 m. There are 19 sawmills in the Amazon Basin area, all steam-powered, which have cut principally mahogany, Spanish cedar, and a few other high-value specialty woods. Logging is almost entirely by hand and the squared and tapered logs are dragged to the streams. There they are made into rafts, supported by species that will float, for floating or towing to the sawmills, sometimes as far as 800 kilometers. Logs and flitches (thick planks for resawing) are sometimes shipped to Belem, Rio de Janeiro, or to European and United States markets on ocean-going vessels, which navigate the Amazon as far up as Iquitos in Peru.

Forest land is largely the property of individual states of the United States of Brazil but private operators may obtain permission to cut public timber. In some states, however, there is a considerable proportion of private ownership, as in the State of Parana, where it is estimated that 33 percent is privately owned. The state governments generally encourage concessions to private operators. For the time

being, no practical form of control by the government over cutting practices of public timber has been devised.

No recent figures are available as to domestic consumption. In 1921, it was estimated that 310,000 m^3 of Parana pine were consumed domestically, and 110,000 m^3 were exported. In 1945, exports of Parana pine totaled 410,000 m^3. Fuelwood is an important item for domestic use, for railroads in the Parana region, and for steamboats on the Amazon. Amazon timber has also been important for use in flooring and furniture. In recent years the tremendous expansion in housing and commercial construction, especially in Rio de Janeiro and São Paulo, has provided a huge demand for lumber and plywood. As utilization of species other than mahogany and cedar is developed, there is little doubt that Brazil can supply not only its own needs but a large export market as well for many years to come.

In addition to the sawmills there are nearly 200 plywood plants with a capacity up to 100,000 m^3. There are about 50 paper mills. Expansion of production from wood conversion plants will require greater development of transportation facilities.

The government forest administration consists of the *Servicio Florestal* (Forest Service) in the Ministry of Agriculture which administers the national forests and national parks. In accordance with the Forest Code of 1934, it studies questions of silviculture, wood technology, and forest production methods, and supervises the Botanical Gardens of Rio de Janeiro. Several states have their own forest services. The *Instituto Nacional do Pinho* (National Pine Institute) was set up to control production, allocate available transportation, carry on reforestation, and enforce proper cutting practices on private operations in the Parana pine region.

The principal research work, aside from botanical exploration, has been carried on by the Institute of Technical Research at São Paulo, which has made strength tests of many species of timber. The University of São Paulo and the University of Rio de Janeiro have instituted courses in dendrology and wood technology. The latter institution has recently expanded its courses and has asked trained foresters from the *Servicio Florestal* to teach silviculture, management, reforestation, and studies in forest products.

British Guiana

British Guiana has an area of 21 million hectares with a population of 381,000. Forested land makes up 87 percent of the total surface area, equalling 18 million hectares. About 64,000 hectares are cultivated. Rivers are the main form of transportation, the principal ones being the Essequebo and the Demarara.

It has been estimated that 20 percent of the total forest area of British Guiana is immediately accessible for exploitation. In this area there are about 350 million m^3 of wood of which 8 million m^3 are greenheart, *Nectandra rodioei*.

Land is held principally by the Crown, which grants concessions for cutting by private operators. There is some small private ownership.

Internal consumption, based on production from the Crown lands plus imports minus exports, is 20,000 m^3

Eucalyptus trees grown near São Paulo, Brazil. There has been considerable planting of exotic species near large cities where forests have been badly denuded.

—0.05 m^3 per caput per year. During the war, consumption increased to 40 thousand m^3 but there are still local shortages of all forest products as the needs for firewood, charcoal, and other minor forest prod-

ucts have increased with the population.

The 46 sawmills have capacities ranging from 408 to 5,900 m³ of lumber per year. Some 150 woodworking establishments produce furniture, and there are several boat-building yards.

A Forest Products Association includes all of the large sawmill owners and some of the small ones. It represents the interests of the lumber producers, especially with regard to prices and export policies. A Timber Workers Union, consisting largely of sawmill workers, has been successful in improving wages and working conditions.

Administrative authority over forest land is now divided among three departments. A reorganization, which is now being considered, would combine all three into a single Forestry Department with increased authority and appropriations.

With regard to research, the principal woods have been tested at the Princes Risborough Station in England. Evaluation surveys of immediately exploitable areas are being completed and considerable information on forest resources and timber qualities has been published. Plans are under way to explore the interior forested regions. It is planned to help improve methods of operation and quality of products of small sawmills by expert advice.

British Honduras

British Honduras has an area of approximately 2.3 million hectares and a population of about 60,000. The country comprises a coastal plain in the North, a ridge of high ground reaching 1,143 meters in the center, and in the West and South a relatively small area of undulating country suitable for agricultural purposes. The plains are low-lying with poor drainage. Ninety-five percent of the country is forested but only portions are at present accessible.

The forested area amounts to 2.1 million hectares, of which 55 percent is Crown property and the rest is private property. The principal species found are mahogany, *Swietenia* sp.; cedar; rosewood; pine; and Santa Maria, *Calophyllum brasiliense*.

Annual domestic consumption of wood and wood products amounts to 31,402 m³. Annual exports average 6,200 m³ for mahogany logs and 8,180 m³ for sawn mahogany. Cedar, rosewood, and Santa Maria wood are exported in insignificant quantities. Production of gums, resins, latex, and chicle amounts to approximately 500 tons.

Timber industries are widely scattered and for the most part are located in the pine forests of the coastal plain. The only large band-saw mill is located at Belize but there are six other small sawmills which use circular saws.

The Forest Service supervises extraction in all forests owned by the Crown, as well as the production of chicle and the logging of mahogany on private estates.

Chile

The country consists of an extremely dry northern region where most of the mining activities are located; a temperate central fertile agricultural region, with important forest areas in the south central part; and a cold, wet southern portion which is principally forest.

Of Chile's total area of over 73 million hectares, 22 percent is forest land. The population is over 5 million. This means 3.2 hectares of forest land per caput and 1.1 hectares per caput of exploitable forest land, of which 80 percent is virgin, 9 percent is partially cut or second growth, and 11 percent has been deforested by fire or cutting. There are over 153,000 hectares of plantations, of which 90 percent consists of eucalyptus species and Monterrey pine, *Pinus radiata*. Twenty-five percent of the plantations are of merchantable size. The virgin forest is 93 percent temperate hardwoods and 7 percent conifers. Natural second growth is all hardwoods.

The estimated total volume of marketable timber is almost 2 billion m³; virgin timber is said to average 181 to 263 m³ per hectare except in the far south, where the average is 95 to 127 m³ per hectare.

Ownership of forest land is divided among private holdings, 54 percent; public, 43 percent; and indeterminate because of unclear titles, 3 percent.

Annual cutting in recent years has been at the rate of almost 5.6 million m³. Fuelwood has been the principal use. The annual loss from fire has been over three and one-half times the volume cut. Growth is estimated at 20 million m³ annually.

There are 600 to 700 sawmills, with an average daily capacity of 12.1 m³; 4 veneer and plywood mills; and several paper mills with a total capacity of 44,000 tons annually, of which 95 percent is produced by one company. The manufacture of box shooks by a number of small enterprises, and the production of hewn railroad ties, mine timbers, and poles are also very important industries. Most mills are small, but recently a few larger modern plants have been installed. The *Corporación de Fomento* has plans for new developments, and has already modernized a number of plants.

Individually potted eucalyptus seedlings being grown under shade in Chile.

Government forestry activity is divided among several agencies. The Forest Department in the Ministry of Land and Colonization has responsibility for the national forests and national parks, for some 43 nurseries which are supervised in part by trained agronomists, and for developing a research program. In the Ministry of Agriculture, the agricultural extension agents, under the supervision of a botanist, are being trained to advise farmers on forestry problems. There are also trained foresters in the *Corporación de Fomento* of Chile who are responsible for the forest survey and management aspects of utilization plans. A National Forestry Council, made up of representatives of many different phases of industrial and government activity in forestry matters, serves in an advisory capacity in the development of a new forest policy. This Council is also addressing itself to the problem of extending forestry research and consultation services to private forest industries. Consideration is also being given to providing formal forestry education in order to increase the number of well-trained forestry technicians. The teaching of conservation in elementary schools is being developed, in order to stimulate a real appreciation of the value of forests, in the hope of reducing the very serious present forest fire problem. The Forest Law of 1931 provided the basis for the present forestry organization.

A 43-year-old stand of eucalyptus grown under the shelterwood system in Chile.

Colombia

The total area of Colombia is 115 million hectares of which 30 million hectares are mountainous with altitudes varying between 400 and 6,000 meters. The rest of the country consists of plains, most of them in the eastern and southeastern regions. The forested area amounts to approximately 72 million hectares or 63 percent.

The forests located along the coastal strips are of the evergreen tropical type with trees of considerable size. In the arid plains of la Goagira, as well as in the central part of the country, there are dry forest types.

The problem of transportation is considerably simplified by the 23,400 kilometers of navigable rivers.

In 1945, 1,140 tons of construction wood were imported, whereas during the same period exports amounted to only 180 tons.

The Forest Service is a department of the Ministry of National Economy. Current plans provide for a considerable increase of personnel in the years to come.

The first laws and the first forest decrees are dated 1874, and since that time a considerable amount of legislation has been promulgated. One of the most recent decrees calls for the creation of an Institute of Forestry, which will organize the reforestation of certain regions but whose primary function will be to effect a program of soil and water conservation and secure the utilization of such forest resources as have not been exploited.

The research laboratory of the Ministry of Mines, as well as the School of Mines at Medellin, makes analyses of the physical properties of wood; the Institute of Natural Sciences is beginning a systematic study of the flora of the country; and the Schools of Agriculture at Medellin and Cali are doing work on classification, conservation, reforestation, selection, and improvement of species. Finally, the Forestry Museum, which is a part of the Forest Department, is charged with the study of zones to be reforested, the collection of samples of Colombian woods, and the study of their properties.

Costa Rica

Costa Rica has an area of almost 5 million hectares and a population of 760,000. The largest portion of the population lives in the central highlands and is growing rapidly.

Agriculture is the principal industry and most of the manufacturing activities consist of the processing of agricultural and forest products. There are over 100 sawmills, most of which are very small, with a daily capacity of less than 12 m^3 each. About 20 percent of the area is agricultural and the remaining 80 percent is forest land. The three principal forest types are: evergreen rain forest — 61 percent; deciduous forest — 13 percent; and cloud forest — 4 percent.

There are a number of opportunities for increasing not only domestic consumption of locally produced forest products but exports as well. Most of the export of forest products has been specialty woods for dyes and for cabinet use. At present Costa Rica imports more forest products than it exports. The Inter-American Highway has opened up many of the inaccessible forest areas and it is expected that there will be a large increase in the utilization of timber from such areas.

Many of the numerous species of Costa-Rican woods have already been tested. The Inter-American Institute of Agricultural Science at Turrialba hopes to

develop a forestry training and research program. It has plans for providing vocational agricultural training for students from all over Latin America and expects during 1948 to train a group of Venezuelan agricultural students.

Cuba

The Republic of Cuba, which has a population of approximately 5 million, covers an area of 11.7 million hectares, including Pine Island and the lesser islands.

The forested areas are estimated to cover between 12 and 15 percent of the total land surface and include coniferous, deciduous, and mangrove forests. They occur for the most part on privately owned land (85 percent), especially on land belonging to the sugar industries; the remaining 15 percent belongs to the State. The lowland forests along the coast and on the small islands are accessible from the sea by the use of shallow draught vessels. Other productive forests are accessible by overland roads.

During the year 1946, domestic consumption, including firewood and charcoal, was estimated at 1,210,556 m^3, local production amounting to 1,049,573 m^3 and imports to 166,514 m^3. Per caput consumption was therefore 0.24 m^3. In addition, exports amounted to 5,531 m^3.

Forestry forms a section of the Department of Forests, Mines, and Waterways of the Ministry of Agriculture. The Forestry School at Havana has been in existence for the past 15 years.

There are no exact data as to the number of workers engaged in forest work. It is estimated, however, that about 6,000 to 8,000 fellers and charcoal producers work annually in the forests. Sawmills, of which there are about 200, employ approximately 6,000 workers. Their development will depend upon the possibility of providing modern equipment.

The existing Forest Law sets forth very exactly the manner in which forests are to be managed, their importance, and the forest regulations to be applied. At present, silvicultural activities are limited to the cultivation and free distribution of plants from government nurseries. However, the establishment of experimental forests and research centers is included in the future plans of the Government.

Dominican Republic

The area of the Dominican Republic is 5 million hectares, of which 3.8 million hectares, or 76 percent, are covered with forests. The population is approximately 2,089,000. The agricultural census which the Government made in 1944 indicated the following volumes of standing timber: mahogany 3,600 m^3; capa 5,500 m^3; oak 4,300 m^3; guayacan 1,000 m^3; guaiacum 800; satinwood 1,100 m^3; and cedar 300 m^3.

The pine, *Pinus occidentalis*, deserves mention. The coniferous region is estimated to be 750,000 hectares and constitutes an important reservoir for local requirements and for exports. Exports for the year 1946 amounted to approximately 19,000 m^3, whereas imports were negligible.

There are a number of portable sawmills, generally using circular saws, which are moved from place to place as extraction proceeds. Various government decrees regulate forest exploitation.

The Ministry of Agriculture plans to set up courses in silviculture, once an Agricultural Institute is established.

Ecuador

Ecuador has an area of 45.6 million hectares, of which approximately 23.5 million hectares, or 51.6 percent, are forested. The forest lands may be grouped according to natural regions:

(1) The forests of the Pacific coastal region and the western slopes of the Andes. Here the principal species are balsa, *Ochroma lagopus;* amarillo; lignum vitæ; and mangrove. Also several palms are found, including the toquilla palm, the leaves of which furnish the fiber for Panama hats.

(2) The forests of the central Andean region. This is the most densely populated region and contains principally semidesert species of shrubs and isolated trees. During the past 80 years, plantations of eucalypts, mostly *Eucalyptus globulus,* have been widely established.

(3) The forests of the Amazon region, east of the Andes, called the "Oriente." Because of the continuous rainfall, the area supports very dense rain forest. The best-known species found are gum copal, canelo, cinchona (the bark of which yields quinine), and several palms.

The relative inaccessibility of the natural forests raises difficult problems and management depends on the extent to which communications, particularly land routes, can be developed. The greater part of the forested area belongs to the State, although in the western region there are considerable privately owned tracts. There are prospects for a great development of timber industries as labor is plentiful. Exports, consisting mainly of balsa, amounted to approximately 70,000 tons in 1945, while in the same year 60,000 tons of softwood were imported.

The Agriculture School of the Central University at Quito gives courses in silviculture as part of the general curriculum. The research program of the Technical Bureau of the Department of Agriculture includes work on the reforestation of zones in the Sierras, the study of species most suitable for planting under local conditions, and the determination of the maximum altitude for successful planting of eucalyptus.

El Salvador

About 2 million hectares of the area of El Salvador, which is approximately 3 million hectares, are covered with forests. The population is about 2 million.

The principal topographical features of the country are level plains near the sea coast varying from 5 to 30 kilometers in width; a chain of volcanic mountains inland stretching from the volcano of San Miguel in the West to the border of Guatemala; and along the border of Honduras, a range of interior mountains and plateaus.

The principal forest species are mahogany, cedar, guaiacum, and rosewood. Oak and pine forests are

found in the mountainous regions. There are six electric sawmills in the country, whose daily production amounts to approximately 32 m^3. Annual forest outturn is approximately 90,000 m^3 and imports are approximately 10,000 m^3. The export trade is little developed.

Existing forest legislation is designed primarily to regulate the felling of timber and to assure reforestation and soil conservation. It is the function of the forest bureau dependent on the Ministry of Agriculture to ensure compliance with the law. The National Agricultural Science Center of Santa Tecla is now starting experiments to find species suitable for reforestation of steep slopes which are subject to erosion.

French Guiana

Guiana is administratively a Department of France, with an area of 9 million hectares and a population of about 40,000. Except for a coastal strip, it is almost entirely covered with forests, estimated at 7 million hectares, of which approximately 5 million hectares consist of dense mixed tropical forests.

The greater part of the forest area forms a domain belonging to the State. The growing stock varies widely in composition according to locality. Stands are estimated to include approximately one-third hard species, such as the wacapou, *Vouacapoua americana*, and balata, and two-thirds soft and semihard species, such as the simaruba and various mahoganies. It is difficult to make an appraisal of the quantity of timber available, but it is estimated that the 500,000 hectares of readily accessible forest could yield, if properly exploited, from 10 to 20 tons of commercial timber per hectare over a rotation of 50 years.

About 100,000 m^3 of roundwood, including firewood, are consumed locally every year. Local industries produce approximately 6,500 m^3 of sawn timber, representing a sawlog volume of 13,000 m^3. Between 1,000 m^3 and 2,500 m^3 of wood, principally sawn timber, are exported annually.

Timber is either pitsawn by hand near creeks or navigable rivers or taken to the four mechanical sawmills located on the Maroni River.

The Forest Service is administered by the Ministry of Overseas Territories. Funds have just been granted for completing the inventory of forest resources and creating a forestry research center, but both these projects are only just beginning.

The main purpose of existing forest regulation is to control fellings and protect the forests against destructive exploitation. The French Forest Code will be applied as soon as it has been adapted to local conditions.

Guatemala

Of the total area of Guatemala (11 million hectares), 7.2 million hectares, representing 66 percent of the land of the country, are forested. The population is approximately 3,570,000.

Although forests are scattered throughout the entire territory, the Province of Peten alone contains half the total wooded area. Only one section of it is being worked, although it contains a considerable quantity of high-quality precious woods.

The Government owns approximately 70 percent of the forests and the remainder are under private ownership. Over the country as a whole, 1945 estimates show that 85 percent of the growing stock was hardwoods and 15 percent was softwoods. The principal species found are: mahogany, *Swietenia* sp.; guaiacum or lignum vitæ; primavera, *Tabebuia* sp.; balsa, *Ochroma* sp; pines, *Pinus caribeæ* and *Pinus montezumæ;* and small quantities of cypress and cedar wood.

The volume of growing stock varies from 90 m^3 per hectare, at an altitude of between 760 and 910 meters, to 170 m^3 per hectare at between 1,200 and 1,800 meters. In certain regions, the volume reaches 1,100 m^3 per hectare.

There are approximately 100 sawmills, 20 of which are modern and well equipped. Although there are no precise statistics for production, 1939 output was estimated at 63,000 m^3. In 1944 exports amounted to 1.9 million m^3 of hardwoods and 590,000 m^3 of softwoods, whereas imports were insignificant.

The Forest Service is a division of the Ministry of Agriculture. Its special function is to issue licenses for forest exploitation and to supervise the 22 nurseries, which furnish 18 million plants annually to the Government and to private owners.

Existing forest legislation sets forth conditions for the exploitation and the sale of forest products and also regulations for reforestation. The Government plans the creation of a forestry school and a research institute in the future.

Haiti

Haiti, mostly mountainous, covers an area of 2.9 million hectares. Forests amount to approximately 1.7 million hectares, or 59 percent.

The forests may be classified in the following manner, taking into consideration climatic and edaphic conditions:

(1) Dry forest: rainfall from 500 to 700 mm. Species found: lignum vitæ, white wood, and *Bursera simaruba.*

(2) Semidry forest: rainfall from 750 to 1,000 mm. Species found: campeche, *Hæmatoxylon campechianum; Guazuma ulmifolia;* and mahogany.

(3) Semirain forest: rainfall from 1,000 to 1,500 mm. Species found: mahogany, oak, cedar, and *Lysiloma latisliqua.*

(4) Rain forest: rainfall exceeds 1,500 mm. Species found: pines and *Colubrina ferruginosa.*

(5) Mangrove forest.

The greater part of the forested area belongs to the State. Annual production of softwood lumber averages 10,000 m^3. In 1945 output of finished mahogany articles, almost all intended for export, amounted to about 200 metric tons. Roundwood exports consist principally of lignum vitæ and campeche, total production over the past five years amounting to 4,300 metric tons and 7,800 tons respectively. Over the same period timber imports totalled 2,250 m^3.

The Forest Service is a department of the Ministry of Agriculture. A general survey of the forests, which has already extended over a period of three years, is expected to be completed in the near future. A course in silviculture is given at the National Agricultural School.

Existing forest legislation is concerned chiefly with control of cutting, which requires prior authorization by a qualified official. Trade and transportation of timber may be carried out only by those with special licenses.

Mexico

Mexico's 200 million hectares support a population of about 23 million. The forest area is over 25 million hectares, which, with land not usable for agriculture or grazing, makes up approximately 20 percent of the total land area.

The forests of Mexico have been described botanically but a complete forest survey is still needed. The forest zones consist of: mangrove and palm swamps along the coast; the tropical forests of mahogany, ceiba, chicle, and *cedrella*, in the southern part of the country; the oak and pine forests in the mountainous areas; cactus and mesquite in the dry areas of the northern part; and the pine, cedar, cypress, and fir forests at the higher altitudes.

Figures are not available on domestic consumption. Production of sawn timber is over 500,000 m^3 annually; of hewn timber, over 400,000 m^3; of logs, over 250,000 m^3; and of fuelwood, over 1 million m^3. A large amount of charcoal is also produced. These figures are probably somewhat less than actual production. With an estimated productive capacity of 3 m^3 per hectare, which is almost ten times as much as the actual cut, Mexico should be able to increase forest production appreciably.

In 1940 the Mexican Forest Service was placed under the Secretary of Agriculture and was given jurisdiction over community forests, national forests, private forests, nurseries and reforestation, forest fire protection, game management, and law enforcement. At one time 1,500 nurseries were operated by schools to increase the children's interest in forestry. Over 25 national parks have been set aside and are visited by large numbers of tourists.

The current Forest Law provides for large forested areas to be set aside as protection forest in order to guard the watersheds against erosion and to ensure a water supply for irrigation. Some of these protection zones range in size from 20,000 to 200,000 hectares.

The Forest Law also provides for strict control of cutting practices but enforcement presents certain problems. At the present time operators must obtain permission from government authorities to cut for commercial purposes. Forest taxation is based on the yield of products rather than on the area of property held.

The partition of large land holdings and haciendas has resulted in the formation of many community forests. The number of forest co-operatives is growing and this should offer possibilities for more conservation. There has been considerable progress in organizing "Defense Co-operatives" among farmers to combat forest fires.

Training of technical foresters used to be handled in large part by a Forest School at Coyoacan. In recent years, however, Mexican students interested in forestry have had to obtain their professional training in other countries. There is a Ranger School at Tlalpan, near Mexico City, which trains men to serve as Forest Law Enforcement Officers.

Nicaragua

Nicaragua's total area of 12 million hectares includes 8.9 million, or 69 percent, of forested land. Its population amounts to approximately 1.1 million. Although a great part of the accessible forests have been exploited, there still remain immense unexploited forest tracts, especially along the Atlantic Coast. Exploitation is centered on the Pacific Coast. The hauling of timber is generally done by cattle or mules over dirt roads. River floating is limited to the rainy season and is not commonly used.

Recent annual lumber production amounts to approximately 100,000 m^3, of which about 30,000 are exported. Per caput consumption of lumber is approximately 0.06 m^3. The principal species found in the forests are the pochote, *Bombax* sp., which is in common use, cedar, mahogany, guaiacum, oak, rosewood, and balsa, *Ochroma lagopus*. At present there are 56 sawmills in the country. Modern equipment will be needed for future development.

A new forest act provides for control of cutting and burning of woodland. It is hoped to offset thereby the effects of the habit of burning over the forest land for cultivation. The country's forest administration is part of the Ministry of Agriculture and Labor.

Panama

Of the 7.4 million hectares contained in the Republic of Panama, 5.2 million hectares, or 70 percent, are covered with forests. The population is approximately 688,000.

It is estimated that two-fifths of the forested land is privately owned, although there are no precise statistics on the subject. The forests consist of all the species commonly found in Central America. Annual production amounts to approximately 10,000 m^3. Imports, particularly of coniferous woods, amount to 180,000 m^3 annually. The creation of a forest service is planned, among other government projects.

Paraguay

The 39 million hectares of land in Paraguay support a population of over 1 million people, of which about two-thirds live within 200 kilometers of the capital city of Asunción. The country is divided by the Paraguay River into the Gran Chaco, a vast alluvial plain covered with grass, palms, open stands of scrub trees, cacti, and swamps, and eastern Paraguay, which is the principal industrialized and populated area where most of the commercial forests are located.

The Chaco's chief product is quebracho for tannin and railroad ties. Rough estimates have been made indicating that at the present rate of exploitation the supply of quebracho from a zone of some 4 million hectares would last for 100 years. Aside from this,

little is known as yet about the forest possibilities of the Chaco.

Eastern Paraguay has an area of 16 million hectares, of which 7.8 million hectares (49 percent) are covered with deciduous hardwoods. The forest area consists of over 5 million hectares of virgin forest, the remainder being cut-over or exploited forest land. Farming is the source of livelihood for about two-thirds of the people, and forest products industries, which are second in importance to agriculture, furnish employment for more than 15 percent of the population. Forest products make up over 75 percent of the tonnage and 29 percent of the value of total exports.

About 92 percent of the forests are privately owned, 5 percent government-owned, and 3 percent in national colonies. Over 52 percent of the private ownership is in holdings of more than 25,000 hectares, 20 percent in holdings of 5,000 to 25,000 hectares, and 28 percent in holdings of less than 5,000 hectares.

The forest zones of eastern Paraguay have been divided on the basis of predominance of certain commercially important species:

Northeast—2.2 million hectares with considerable virgin timber. Palo de rosa, *Aspidosperma pilorosa*, makes up 23 percent of the stands which average 130 trees of all species per hectare with a volume of 130 to 325 m^3 per hectare. Cedro, *Cedrela fissilis;* laurel; *Ocotea* sp.; and *Nectandra* sp.; are also important. This zone produces high-grade lumber and logs for export.

Northern—1.4 million hectares. Trebol, *Torresea cearensis,* which is very valuable for furniture, and palo de rosa, curupay, *Piptadenia* spp., lapacho, *Tabebuia* sp., and cedro are the principal commercial species in this zone. The stands average 120 trees of all species per hectare with an average volume of 120 to 288 m^3 per hectare.

Eastern—2.9 million hectares with a large amount of virgin timber. Cedro; lapacho; petereby, *Cordia* spp.; and guatambu, *Balfourodendron* sp.; are important species. The stands average 125 trees of all species per hectare, with an average volume of 63 to 313 m^3 per hectare.

Border (resembles Chaco region)—0.4 million hectares. Quebracho, *Schinopsis* sp., is the most common species in stands which average 115 trees of all species per hectare, with an average volume of 29 to 172 m^3 per hectare.

Southern—1.7 million hectares. Fuelwood and fenceposts are the chief products of this zone. The stands average 115 trees of all species per hectare with an average volume of 69 to 265 m^3 per hectare.

Central—6.4 million hectares. This is mostly cut-over land but with considerable regeneration, averaging 120 trees of all species per hectare with a volume of 60 to 300 m^3 per hectare.

As to volume of timber, it is estimated that of a total of 284 million m^3 of standing timber, 246 million are marketable. During 1943/44 annual extraction of export and domestic saw timber was estimated to be 304,000 m^3 of which 52,000 m^3 were sawn lumber. Other forest products in the same year consisted of almost 17,000 m^3 ties, posts, and palm poles; 506,000 m^3 fuelwood, and almost 16,000 m^3 charcoal.

There are estimated to be 50 small sawmills in eastern Paraguay and perhaps 15 in the Chaco region, and in addition between 700 and 900 hand pitsaws. All of the mills are steam-powered but none use a circular-head-saw. Daily production will rise as soon as new equipment can be installed. The Paraguayan - U.S.A. co-operative agricultural service (STICA) operates a modern circular semiportable mill with tractor power, to show how lumber production can be improved and increased. A plywood plant is producing rotary veneer for crates and boxes for the meat-packing industry. This plant has the most important dry kiln in Paraguay. The four tannin extraction plants are situated in the northern part of the country.

The domestic market, which is now limited to the Asunción area, could readily be expanded. Argentina is the principal export market.

It is estimated that about 55,000 men are employed directly in the wood-using industries; 1,900 for general labor; 28,000 in logging; 1,500 at sawmills; 4,500 in woodworking installations; 1,800 at pitsaws; and 18,000 in transportation. Training could increase the efficiency of labor with consequent improvement in incomes. Organization of labor unions is increasing.

Issue of cutting and transportation permits is vested in the Department of Lands and Colonization. As yet there is no agency directly responsible for forest exploitation or utilization. The program of STICA is beginning to create interest in tree planting, nurseries, and more careful methods of exploitation and utilization. Private plantations of eucalyptus, araucaria, casuarina, and poplar have been started on a small scale.

Peru

Peru has a total area of about 125 million hectares and a population of almost 7.8 million. The country consists of a narrow, dry, coastal plain with mountain valleys which permit some irrigation; a massive cordillera 320 to 400 kilometers wide containing the chief mineral deposits; and the forested *Montaña* which covers over half the country and is made up of the eastern slopes and foothills of the Andes Mountains and the Amazon River lowlands. Total forest area is estimated at 70 million hectares.

The principal forested area is the Amazon Basin covering some 68 million hectares, a very small fraction of which is privately owned, or inhabited. The city of Iquitos is the important lumber and shipping center, with products moving down the Amazon through Brazil to the ocean, and thence through the Panama Canal to the West Coast of Peru. The volume of standing timber is still undetermined but is known to be very great.

Sawmills are very few in number. Lima and other cities depend on lumber yards which resaw imported lumber. There are a number of mahogany and cedar mills in the Iquitos-Pucallpa area in the Amazon Basin. The *Corporación de Fomento* of Peru is planning the expansion of wood-using industries in this area, as well as in the foothills.

The Forest Service under the Ministry of Agriculture is in the process of building up its staff to permit control of forest exploitation of public lands. The country's forest resources will require the services of a great number of technicians. Until now students interested in forestry have studied abroad. A voca-

tional agricultural training school has been started at Iquitos to help solve the problem of providing food and skilled labor for the wood-using industries in the Amazon Basin.

Adequate forest legislation to guide the development of resources and of their utilization is now being considered. The major problems include the serious need for more railroad and highway construction to connect the West Coast cities with the Amazon Basin, more technicians, modern sawmill and dry kiln equipment, and surveys of the forest resources. The labor supply, especially in the Amazon Valley, is a critical problem and is tied up with the need for food production and medical facilities in that region.

Puerto Rico

Puerto Rico is an island of nearly 1 million hectares with a population of about 2 million. Thirty percent of the population is urban, and 70 percent rural. Farmland covers 720,000 hectares and forested land over 200,000 hectares.

Ownership of the forested land is divided between insular forests—18,000 hectares; federal forests, 13,000 hectares; and private forests, 53,000 hectares. In addition there are 6,000 hectares of woodland pasture and 73,000 hectares of coffee plantations, privately owned; and some 37,000 hectares of potential forest land whose use and ownership status is not clearly established.

It has been estimated that forests are being depleted by over 2 million m^3 per year. Of this 9,000 m^3 are used for lumber; 800,000 m^3 for charcoal; 1,400,000 m^3 for fuelwood; and 6,000 m^3 for miscellaneous agricultural purposes. In contrast the growth is estimated to be only 12,000 m^3 of sawlog size and 1,600,000 m^3 of all other tree growth, including brush.

Estimates of timber requirements include 2,400,000 m^3 for fuelwood or 1.2 m^3 per caput per annum; 1,298,000 m^3 for public and private housing, schools and public works; 7,000 m^3 of imported lumber for sash and door manufacture; over 5,600 m^3 for furniture, of which some 1,400 m^3 can possibly be produced locally; 2,360 m^3, about one-half in the form of shooks, largely from imported material, for boxes and crates; as well as 9,000 m^3 for railroad ties, about 5 percent of which can be produced locally; and 2,700 poles from imports.

Most of the locally produced lumber is obtained by handsawing, with only two or three sawmills producing hardwood for furniture. Efforts to expand the wood-using industry include plans for a bigger furniture industry, sawmills, possibly a planing mill, and a central lumber yard. Logging, owing to the topography and the very light cut which is permissible to avoid serious erosion, will probably remain a hand rather than a power operation.

The administrative organization comprises the Insular Forest Service and the Caribbean National Forest of the United States Forest Service, with a joint Chief, who is also Director of the Tropical Forest Experiment Station. In addition, the Puerto-Rican Reconstruction Administration handles land-use and resettlement projects and the Puerto-Rican Development Company has been set up to handle the expansion of wood-using industries. Research is carried on at the Tropical Forest Experiment Station at Río Piedras in reforestation, silviculture, and forest inventory. The present Director of the Tropical Forest Experiment Station also serves as head of the Forestry Committee of the Caribbean Commission.

No forestry training is provided at the University of Puerto Rico or at the Agricultural College.

Future legislation will have to devise controls of cutting methods and provide for the expansion of the work of the Insular Forest Service.

Surinam

Surinam's area of 15.5 million hectares supports a population of 200,000. Rivers form the principal means of transportation into the interior. The coastal alluvial strip is the principal inhabited region and cultivated area. Not quite 52,000 hectares are under cultivation. The mountainous area, which is largely unexplored, contains some savannahs which are said to be caused by mankind.

Sixty-eight percent of the country is forested land with an unknown but great volume of timber. The land is held by the Crown, which grants timber-cutting concessions to private operators.

There is no information available on growth or on domestic timber requirements. Local housing construction is mainly of wood. Surinam is beginning to help meet the large demand for logs, plywood, and lumber in the Netherlands.

There are ten sawmills with an annual capacity of 30,000 m^3. A modern new sawmill and a plywood plant are being planned. Hand-hewn railroad ties, fuelwood, and charcoal are important products.

The original Forest Administration, formed in 1904, was disbanded in 1925 and reinstated in 1947. It consists of a Conservator, who is a trained forester, under the Ministry of Finance and Commerce, with several assistants. There are also a number of forest guards who are responsible for checking the timber removed from cutting concessions on Crown land.

An aerial forest survey is now in progress and is to be completed within a period of four years. A special study of resources and exploitation possibilities was made in 1947. Between 1900 and 1925 some small plantations were established for experimental purposes. There are no local facilities for training technicians.

Trinidad

The island of Trinidad, with an area of 512,000 hectares, has 300,000 hectares, or 59 percent, of forested land. State forests contain 14,206 hectares which are considered a national domain where no exploitation is allowed. In addition, 23,957 hectares are classified as production reserves and 93,000 as protection reserves. The remainder is classified as productive forest except for approximately 20,000 hectares of marsh and waste regions. The privately owned forests consist, for the most part, of poor quality brushwood of little value.

Transportation of wood is greatly facilitated by a good network of roads. There are 59 sawmills and one match factory. Sawmill equipment is still rather primitive. There are numerous furniture factories and woodworking shops, and much charcoal is produced for local use. The sawmills process 5,500 m^3 of various kinds of wood annually. The match fac-

Timber sold from a forest reserve is measured in Trinidad.

tory consumes 2,294 m^3. In the State forests 14,000 m^3 of unbarked or undressed timber was sawn by hand in 1945. During 1945, also, the State forests produced 20,000 m^3 of firewood and 65,000 m^3 were processed into charcoal. Production from private forests is negligible.

Almost all construction wood produced is used on the spot. Exports are insignificant. On the other hand, imports of softwoods amounted to approximately 1,200,000 m^3 in 1945.

The Forest Service forms a part of the British Colonial Forest Service. The establishment of a research division in the Forest Service is planned for the future.

Since the natural forest includes a great variety of species of no commercial value as yet, it has been decided to confine future exploitation to easily accessible plantations, in order to make the island self-sufficient in construction timber.

Uruguay

Uruguay has a population of over 2.2 million people and less than 19 million hectares of rolling land. A third of the population lives in Montevideo, the capital city. There are almost 375,000 hectares of natural forest and over 77,000 hectares of plantations. The principal streams are the Uruguay, Negro, Yi, Santa Lucia, Queguay, and Cebollati Rivers. The highest elevation does not exceed 700 meters above sea level. Transportation facilities, such as roads and railroads, are well developed.

The principal forest activity so far has been the planting of windbreaks, largely eucalyptus, willow, poplar, and *Pinus radiata*, around farms. Plantings have also been made for local fuelwood and fencepost production. Most of the land yields more from farming than it would from forest production, resulting in a small output of forest products. Uruguay imports almost all of its lumber and fuelwood, Parana pine from Brazil being an important item.

Venezuela

Venezuela, with an area of over 91 million hectares, has a population of over 4.4 million. The country consists of the mountainous regions of the Andes and coastal ranges in the Northwest, the Orinoco Basin and *llanos* in the South, the Guiana highlands in the East, and the coastal plain including the area around Lake Maracaibo.

Over 40 percent of the country is forested, but timber production is still in the early stages of development. Much of the forest in the coastal range of the Andes and around the Maracaibo Basin has been cleared for agriculture, and erosion is a serious problem in these regions. The *llanos* are treeless except along the rivers. The vast forests south and east of the Orinoco River, in the Amazonas Territory and in the Guiana highlands, are largely unexplored. Most forests are owned by the Government.

There are between 10 and 20 sawmills in the towns of Puerto Cabello, Valencia, Caracas, and Maracaibo. However, most of the timber used in the oil fields and in the construction of the recently established steel industries has been chemically treated southern pine, *Pinus palustris*, imported from the United States. Local forest products include rubber, balata, tanning material, dye woods, tonka beans, chicle, barbasco root (for insecticides), and cinchona.

The forest administration forms part of the Ministry of Agriculture. Considerable work has been done on the botanical description and classification of forest vegetation. The Forest Department also supervises several forest nurseries for the production of trees on farms and for ornamental purposes in towns. Experimental work has been carried out on methods of handling seeds.

The *Corporación de Fomento* of Venezuela is planning to obtain technical assistance to make a survey of forest resources and to develop plans for sound forest exploitation. The Venezuela Basic Economy Corporation, a local unit of the International Basic Economy Corporation, seeks to develop local industry and is anxious to co-operate with the *Corporación de Fomento* in its plans.

Photos accompanying these articles are reproduced by courtesy of the Argentine Embassy; the U. S. Forest Service; Victor Bianchi, Department of Forests, Chile; and Tom Gill.

The Work of FAO

International Forestry and Forest Products Conference for Latin America

One of the greatest undeveloped forested regions in the world is found in South America. A concerted effort to develop these forests is being made and will be marked by the opening on 19 April 1948 at Teresopolis, near Rio de Janeiro, Brazil, of the International Forestry and Forest Products Conference for Latin America. The Conference is the second in a series planned by FAO. The first conference, held at Marianske Lazne, Czechoslovakia, in 1947, dealt with the emergency and long-term European timber situation.

Calling of the meeting follows the recommendation of the FAO Conference at Geneva last autumn, which emphasized that development of the vast timber wealth of Latin America would help raise living standards there and might contribute additional lumber supplies urgently needed for the reconstruction of war-devastated areas.

The Government of the United States of Brazil will act as host to representatives of all the Latin-American Republics and of certain other member countries with special interests in Latin America or in the subjects to be discussed. Observers have also been invited from the United Nations and other public international organizations, including the Pan American Union and the Caribbean Commission.

A Preparatory Committee has been established in Rio de Janeiro, and communications concerning the Conference can be addressed to AGRIRURAL, Para Comissao Floresta, Rio de Janeiro, Brazil, or to FAO in Washington, D. C., U. S. A.

Activities of FAO's Subcommittee on Unexploited Forests

The first meeting of the Subcommittee on Unexploited Forests was held at Geneva, Switzerland, 20-22 August 1947, just before the Third Annual Conference of FAO. The Subcommittee, working under the chairmanship of Tom Gill, Secretary of the Charles Lathrop Pack Foundation, was composed of tropical forestry experts for British territories, Professor Stebbing and Mr. Scott; for French territories, Mr. Terver and Mr. Fournols; for Belgian territories, Mr. van den Abeele; for Netherlands territories, Messrs Gonggryp, Sewandono, and Winkoop; and for the Latin American countries, Peru—Mr. Bazan, Colombia—Mr. Salazar, and Brazil—Mr. de Souza and Mr. de Fonseca. S. B. Show, chief of the Forestry Branch of FAO's Division of Forestry and Forest Products, attended the meetings. Pierre Terver was appointed Secretary of the Subcommittee.

In view of the number and variety of points requiring study and of the great importance of some of them, it was decided that work should be confined to outlining the most serious and urgent problems calling for solution in tropical and subtropical parts of the world, so as to assist the branches of FAO in their tasks by providing them with technical data on problems peculiar to those regions. This will enable them to make suggestions and give advice, to countries desiring guidance in this sphere, on the broad lines of a rational and general forest policy.

Forest Products

Tropical and subtropical zones contain vast stretches of forest, the exploitation of which should be contemplated if the world shortage of timber is to be speedily reduced. One of the most important problems therefore concerns the measures to be taken the promote the large-scale use of exotic wood, hitherto practically unknown.

The Subcommittee came to the following general conclusions:

1) It is vitally necessary to extend considerably the range of use of commercial exotic species, so as to increase first of all the yield of these forests and thereby satisfy to an appreciable extent the swollen demands of markets, particularly for industrial timber and lumber. Once this has been done, it will be possible to mechanize exploitation, an essential requirement in view of the extreme scarcity of labor in some of these regions; moreover, the cost of production, which has hitherto been prohibitive, could also be reduced. These exotic species would thus be able to compete with native timber in consumer markets.

2) In order to encourage trade in exotic woods, it would seem necessary to standardize the terminology of forest species of economic importance. However, in view of the practical difficulties, already well known to technicians, in the way of the speedy achievement of such a reform, the Subcommittee feels that, during the initial stage, it would be best for early work to confine itself to the three following objectives:

a) the standardization of scientific names of species which are well known and clearly determined;

b) the compilation of tables giving the scientific and the corresponding vernacular and trade names used in different countries for these species;

c) in the case of little-known, new species for exploitation and distribution, until such time as they are precisely identified, the compilation of a simple commercial classification arranging them by similarity of their technological characteristics and possible uses.

To this end, FAO should establish an identification and nomenclature committee consisting of the most highly qualified technicians in this sphere who are willing to undertake the task.

3) Study of the physical, mechanical, and technological properties of all exotic woods of economic importance should be vigorously pursued and even intensified, and FAO should continue to collect, analyze, and distribute all information on the subject passed on to it by existing laboratories.

The Subcommittee does not favor the carrying out of a comprehensive program of work in a joint laboratory, since it does not consider that FAO should supersede action by governments where this has already been taken. On the other hand, for countries not yet in possession of organizations capable of undertaking these researches, and in particular for the Latin American nations, it is of the opinion that FAO's most urgent task should be to continue to use its good offices to arrange for work requested to be carried out in existing laboratories of member nations able and willing to undertake it. It should also encourage these countries to accept for training young technicians from other countries.

4) At the same time and with the approval of the Latin American countries concerned, FAO should take the initiative in organizing the establishment of a joint forestry research laboratory for that continent.

5) Research on seasoning and steaming, parasite control, and the general conservation and preservation of exotic

woods at the place of production, in transit, and during use are regarded by the Subcommittee as particularly important and should be intensified in all countries. In this sphere, FAO should continue to play its part as a world documentation center. The same applies to the study of conditioning rules and the determination of exotic wood standards.

Forest Protection—General Policy and Legislation

In tropical and subtropical regions the three great enemies of forests, the ravages of which can adversely affect living conditions over immense areas and sometimes reduce the land entirely to desert, are shifting cultivation, annual firing, and excessive grazing. These factors have a direct bearing on the composition and even the preservation of forest stands, on soil fertility, and on water conditions; they are the chief cause of erosion phenomena, which are particularly serious in mountainous regions.

The Subcommittee has arrived at the following general conclusions as to the means to be taken to protect threatened countries from these scourges.

1) In those regions the agricultural problem is intimately connected with the problem of forestry; indeed in some places it is primarily a forestry problem, since agriculture in those countries is necessarily forest agriculture.

It is essential, therefore, on the one hand that foresters should intervene quickly to restore the now disrupted equilibrium between agriculture and forests, and on the other hand that their part in agriculture should be primary and not secondary as it is tending to become in some countries. The example of the Belgian Congo — where there is no hesitation to give forest specialists managerial posts of agricultural importance in certain threatened areas—should not be overlooked.

2) As to the question of farming on forest soils it may be as well to reconsider our brutal condemnation of ancestral indigenous practices. Rather than try to establish agriculturists too quickly it would probably be better to canalize nomadism by the restoration of indigenous methods of cultivation, subject, of course, to the necessary improvements. This first stage of the operation can only be carried through effectively by agricultural and forestry experiment stations and by the establishment of permanent contact between foresters and agriculturists and the local population, in order that the former may become familiar with the people's mode of life and working methods and win their confidence.

In this connection the problem which undoubtedly dominates all others is that of fallow land since native farming has to be catch crop farming in fallow forest, with adequate crop rotation to maintain soil fertility and ensure conservation of the forest. Next come problems of soil fertility, and here the main aim must be to conserve and increase the small quantity of humus existing in those soils still unstabilized.

3) Nevertheless, FAO cannot undertake to elaborate a standard system of agricultural methods for tropical and subtropical regions, in view of the extreme diversity of physical and economic conditions in those countries and the varying stages of development of their populations. It must therefore confine itself to the task, already very important in itself, of providing a center for study and documentation along the lines on which it has already embarked.

Moreover, it can use its influence to develop air survey, in countries which do not already use it, as a basis for forestry and land inventories, and for soil maps which will facilitate the appreciation of agricultural potentialities and consequent definition of agricultural and forest policies.

Finally, since questions of publicity and the education of the peoples are most important, it would be particularly desirable for FAO to request governments to secure for this plan of forest conservation the collaboration of all public officials, local landowners, village leaders, and the local people themselves, through the intermediary of local executive officers at all levels.

4) The problems connected with the control of forest and bush fires and soil erosion call for measures of a somewhat similar kind to the action that needs to be taken against shifting cultivation. The lack of effective provisions shows that legislation in this sphere must be decentralized and its application often left to the initiative of local authorities or even to the traditional native authorities. Here again FAO can play an important part and keep the various countries informed of the results achieved elsewhere. In particular it could serve as a channel of information for the Soil Conservation Service of the United States of America so that the very efficient methods of checking soil erosion adopted in that country can be brought to the notice of the member nations.

5) As regards the fundamental principles underlying the forest laws that should be drawn up in countries that as yet possess none, it is important in the first place to ascertain the results achieved in territories that have already had a fairly lengthy experience in this field and where the "period of development and testing" necessary for the framing of rational and effective provisions is already over.

These studies might bring out the main universal principles which are fundamentally the same in all countries.

Ample data could be furnished by the archives of the international organization for comparative colonial legislation at Brussels, the work of the second International Forestry Congress at Budapest, the documents on forest laws in the Indian peninsula and the French overseas territories and the researches and summaries already undertaken by the technical divisions of FAO. But before it is possible to draft legislation appropriate to a given country, many other data must first be obtained. If FAO wishes to help the Latin American countries to frame progressive forest laws it must possess a modicum of information about the different requirements affecting climate, water supplies, soil, economy, and population that must be met in each of the countries concerned. In particular, a thorough knowledge of the system of land tenure is essential, since in most cases the first thing to be done will be to map out a forest area.

6) It is self-evident that if forest legislation is to be in any way effective there must be a well organized, competent, and adequately staffed forest service in the country. The problem of the creation of such forest services in countries which do not as yet possess them is very similar to that of the creation of laboratories. Not only must the forestry schools already in existence open their doors to the young forest officers of those countries and provide them with training but the surplus technicians must also be put at their disposal.

All this, however, is only a palliative, and it is essential to provide for the setting up of new forestry schools for advanced training. In view of the various difficulties involved, and in particular the relative scarcity of able teachers with a specialized knowledge of tropical forestry problems, a joint teaching service might be contemplated for the Latin American countries. This teaching service should fit in harmoniously with the laboratories that need to be created, and the whole would form a suitable forestry research institute for Latin America, in the setting up of which FAO might take a hand, in conjunction with the countries concerned.

Forest Preservation

The Subcommittee confined itself to the following conclusions:

1) The questionnaires on the world forest inventory for 1947, as prepared by the staff of FAO, following the recommendations of the Washington and Rome Statistical Conferences, undoubtedly contain many imperfections from the point of view of countries with tropical and subtropical forests. Nevertheless, considering the very great difficulty of framing a single questionnaire to cover all types of forests in the world, every effort should be made to use the questionnaire.

This being the case, it is essential that governments reply to the questions put to them to the best of their ability so as to enable FAO to collect and collate in a systematic manner information on the subject of world forestry. Nevertheless, in order to remedy the imperfections and, above all, to fill in the gaps in the questionnaire, countries which are in a position to do so should attach to their replies a report containing additional information and explanations and bringing out the points peculiar to tropical regions. In this connection cartographic documents would be of the greatest value.

2) With regard to reafforestation, it is first of all necessary to ascertain in which regions deforestation must be checked and reafforestation urgently undertaken. As these zones may well extend over the territories of several countries, FAO could render governments the important service of aiding in the co-ordination of their efforts.

With regard to the actual technique of reafforestation, it is important to warn countries against certain practices which are always very costly and the results of which are doubtful and often definitely harmful. As the problem invariably depends on ecological questions, it is often necessary to recreate the forest climate. So long as a certain amount of vegetation still remains, one must allow the forest to re-establish itself, simply taking measures to protect the area. Finally, emphasis was placed on the cardinal principle in reafforestation—which is almost always to utilize local species—and also on the principle of creating mixed

stands. In these circumstances an exchange of information between distant countries and the drawing up of a list of species suitable for reafforestation purposes are of relative importance only.

3) From the gamut of questions broached by the Subcommittee in the course of its discussions, it is apparent that FAO is not yet adequately organized to work out solutions for all the numerous and varied problems which have been submitted to it and which it should endeavor to solve region by region, not on a world scale. With regard to tropical and subtropical forests, therefore, the establishment of regional offices in Latin America, Africa, and the Far East, already recommended by the Copenhagen Conference, appears both essential and urgent.

The following nine recommendations drawn up from the results of the discussions were unanimously adopted by the members of the Subcommittee on Unexploited Forests:

THE SUBCOMMITTEE RECOMMENDS:

1. That FAO should assemble all existing documentation concerning tropical and subtropical woods, especially material on scientific identification and on laboratory tests; that it should digest this material and disseminate it to member governments; that the latter hasten to advise the Division of Forestry and Forest Products of FAO regarding all studies, either of a general or specific character, made concerning the forest products of the territories over which they have jurisdiction.
2. That FAO should establish a committee on the identification and nomenclature of tropical and subtropical species of economic interest; that the essential aim of this committee should be to standardize scientific nomenclature and establish concordance of common and trade names; and that the committee should also undertake the establishment of a commercial classification of species based upon technological characteristics.
3. That FAO should continue to collect all the literature bearing on shifting cultivation and its consequences and control in tropical and subtropical countries, digest it for the benefit of member governments, and encourage interregional contacts for the examination and solution of the problems arising; that FAO should stress the very urgent need for administrations to act through their local executive officers, local landowners, village leaders, and the local people themselves against gross misuse of soil by shifting cultivation, excessive grazing, or annual firing.
4. That FAO use its influence to develop, in countries which do not already use it, air survey as a basis for forestry and land inventories, and for soil maps which will facilitate the appreciation of agricultural potentialities and consequent definition of agricultural and forest policies; act as intermediary with the Soil Conservation Service of the United States of America so that the anti-erosion measures adopted there may be communicated to the member governments; and that in this connection attention should be paid to agricultural equipment and legislation for erosion control.
5. That FAO should establish contact with the Latin American countries wishing to draw up progressive forestry legislation, in order to frame a policy defining the different requirements affecting climate, water, soils, and social and economic conditions in each of the interested countries; that, having obtained this minimum of necessary information, FAO will do all possible to help the technicians of these countries in drawing up preliminary drafts of laws.
6. That FAO should take the initiative in organizing the creation of a forestry institute with research laboratories in the common interest of the Latin American countries, which urgently need such an institution, and with teaching facilities for the professional training of foresters; that pending the setting up of such an institute, FAO should continue to use its good offices to have urgent work for Latin America done in existing laboratories of member countries able to undertake it, and to assure that those countries accept for training in their forest schools and laboratories the forest technicians of Latin America.
7. That FAO, in consultation with member governments who ask for assistance, should enquire into and specify the tropical and subtropical regions of the world in which it is essential to check deforestation or reforest immediately for climatic or social reasons or water conservation; that FAO should continue to collect and publish all available literature on the possibilities of using natural regeneration in these countries, and should list for natural regions the local species, and eventually the exotic species, suitable for reforestation, and for each of these species the correct technique to use.
8. That FAO request governments which have territories located in tropical or subtropical regions to furnish the most complete information possible in response to the forest inventory questionnaires sent them, and, since the headings of the inventory may not apply to particular regions, that the governments be asked to attach to the questionnaire form all reports, charts, and explanatory comments which could clarify for FAO specific details regarding the forests and forest products of these regions.
9. The Subcommittee on Unexploited Forests, believing in the necessity for seeking local solutions of the silvicultural problems of the world, considers essential the creation without delay, under FAO's Division of Forestry and Forest Products, the regional offices already recommended by the Copenhagen Conference, to deal especially with the tropical and subtropical forests of Latin America, Africa, and the Far East.

Third World Forestry Congress

The 1947 session of FAO's annual Conference, held at Geneva, passed a resolution calling for a World Forestry Congress in 1949. The Government of Finland has now informed FAO that it is willing to act as host to the Congress. An organization committee, of which Eino Saari is the chairman, has been appointed.

The Copenhagen session of the annual Conference had already urged continuation of the plans, made before World War II, for a third World Forestry Congress to be held in Finland. It is, therefore, most gratifying that the Government of Finland should be able to resume its role of prospective host to this Congress at Helsinki.

The first World Forestry Congress was held in Rome in 1926. The second was convened at Budapest in 1936. These two conferences have been milestones in the development of international co-operation in forestry. The impetus which they gave has become evident in the ever-growing common effort for a solution of the many problems affecting forestry and forest products. When this third Congress reviews the progress made since 1936, it will be seen how greatly ideas and practice in various countries have benefited from international exchanges of view and experience.

International Poplar Commission

The International Poplar Commission met on 27 and 28 October 1947 at Brussels, under the chairmanship of Ph. Guinier (France). FAO was represented at this meeting.

After having prepared a statement as to the uses of poplar wood and put the finishing touches to a record of identification, the Commission studied a plan of nomenclature for poplars as well as other questions of great interest, particularly those of the exchange between countries of species of poplars, the fight against crust (canker), and the institution of control over the various species.

News Of The World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *The Editor will be glad to receive direct from readers authenticated items of interest and of news value for this part of the review.*

Forestry

Forest Resources and Utilization

FRANCE

Forest exploitation in the *landes* is assuming an increasingly industrial character; row-seeding of pines is more and more frequent and exploitation is currently started after 45 years. Sowing is done by machines which clear the undergrowth and sow two hectares per hour. Seeds required for the replanting of the vast areas recently destroyed by fire are to be provided from permanent sources, supplemented by a yearly supply of 50 to 120 tons of seed from Portugal. This development does not blind foresters to the fact that it may have serious disadvantages. Pure stands of maritime pine, *Pinus pinaster*, are harmful to the soil and are vulnerable to attacks by insects and pests. Abundant undergrowth constitutes a fire hazard. Research, therefore, is being directed towards the formation of mixed stands. According to the types of soils, there may be possibilities for red oak, *Quercus borealis;* Oriental planes, *Platanus orientalis;* red gum, *Liquidambar styraciflua;* certain Mediterranean silver fir varieties, *Abies* spp.; and perhaps also Corsican pine, *Pinus nigra* corsicana; mountain pine, *Pinus montana;* and various Asiatic pines.

INDO-CHINA

Some 35,000 hectares of *Pinus merkusii* have been tapped for resin since 1942 and production has risen considerably. Tapping has been the best way of putting to use old, sparse stands under sound management. The method of tapping is the same as that used for the maritime pines of the *landes*. Tools, however, have been adapted to the requirements of local labor and the schooling of workers was difficult.

KOREA

About 73 percent of the total area of the country (16 million hectares) is covered with forests. Sixty percent are privately owned, 33 percent state owned, and 7 percent the property of the provinces. Local climatic conditions favor softwood forests mixed with birch in the north and pines and hardwoods in the central and southern regions. The two main coniferous species are Korean pine, *Pinus koraiensis*, and red pine, *Pinus densiflora*. The latter is of very small girth, often twisted, and is usually cut at the age of 25 to 30 years. Because of increases of population between 1700 and 1900, the forests around the main population centers have been heavily overtaxed and erosion damage has been serious. By 1910, 65 percent of the wooded surface was denuded or left thinly covered. The Japanese administration embarked on an extensive reforestation program and enacted legislation protecting forests. By 1930, some 8,100 hectares were being planted yearly. This program, however, was not continued after the invasion of China, and the need for fuelwood again depleted the forests. Notwithstanding its relatively high percentage of forest, Korea can supply only 78 percent of her wood consumption needs. The division of the country into two parts by the Russian and American occupation zones has created new difficulties. The northern zone, under Russian occupation, contains 60 percent of the forest area and produces about 70 percent of output but has only 30 percent of the population. Methods of production and utilization are still primitive.

NETHERLANDS EAST INDIES

An important lumber industry is being planned for Netherlands Borneo. Forest concessions have been allotted and the exploitation of conifers is expected to comprise a large part of the lumber activities. An initial investment is to be made in a large sawmill with an annual capacity of 120,000 m^3 of timber. An agreement has already been made whereby the Department of Public Works and Waterways will be supplied with 20,000 m^3 of timber annually for a period of five years. A cellulose factory is also planned as an auxiliary industry to the timber activities. The government has been invited to contribute up to 30 percent of the total capital needed for the entire enterprise. The venture is of vital concern to the authorities, inasmuch as its success would encourage further exploitation of the large timber resources of the country and would contribute materially to the prosperity and industrial growth of this underdeveloped area.

UNION OF SOUTH AFRICA

Before the war, about 2.2 million m^3 (78 million cubic feet) of softwoods were imported annually and the country was entirely dependent on imports for supplies. An extremely critical timber position might have resulted during the war, had not the yield of South African plantations been increased from 85,000 m^3 (3 million cubic feet) to 708,000 m^3 (25 million cubic feet).

UNITED STATES OF AMERICA

The Bureau of Labor Statistics reports that for the early part of 1947 sawmills had the worst accident rate in industry. Of the six industry groups having the highest frequency rate, five were woodworking groups. The average number of disabling work injuries per million employee-hours worked is shown below for these groups.

Sawmills	67.9
Combined sawmill and planing plants	56.0
Planing mills	44.8
Iron foundries	43.6
Wooden container plants	42.8
Plywood mills	40.9

Logging had an even worse accident record than sawmills but is not reported as a "manufacturing" industry.

An investigation is being undertaken into the financial aspects of forestry in New England woodlands to ascertain how the region can get the most benefit from its forest resources. The investigation will cover forest lands, and the uses and markets for their products, in order to determine what practices will ensure the maximum yield of forest products on a sustained basis. Possible financial impediments to sound forest management, such as taxation and fire risk, will be investigated and programs will be fostered to secure expanded use of forest lands for wood products, recreation, and other purposes. The material assembled by the investigation will also be used by banking institutions in order to revise their policy affecting lending operations to land owners, forest operators, and wood-using industries.

UNION OF SOVIET SOCIALIST REPUBLICS

A forest of 100-year-old cedars disappeared in the explosion of the Sikhote-Alin meteorite which fell in the Siberian coastal mountains northeast of Vladivostok early in 1947. A scientific expedi-

tion reported that the meteorite apparently broke up before reaching the earth. It formed 106 craters and holes in an area of 12 km. x 600 m., as well as 250 meteorites weighing 5 tons in all. Near the main crater the dense forest is said to have disappeared completely, whereas around the smaller craters individual trees remained standing, though shot through with meteoritic fragments.

Forest Policy

ARGENTINA

The two main objectives of the government's forest policy have been summed up as the conservation of present resources and the afforestation of denuded soils. A country-wide investigation is ascertaining the best methods to be used in carrying out the government's forest policy, thereby doing away with the system of forest concessions which has been branded as "legalized devastation." The legal instrument for the implementation of this policy will be the forest protection law which is actually a whole code of forest legislation. This forest protection law is part of the legislation for industrial protection and development and part of the five-year plan for 1947 to 1951.

FRANCE

Regulations regarding the use of the national forestry fund provide that all forest owners may benefit from subsidies giving from 50 up to 80 percent of the cost of reforestation work and equipment, of fire-fighting equipment, and of fighting pests and insects. Grants may be made in kind, as either seeds or plants. At the request of owners, work can be carried out entirely under the direction and at the cost of the government. In this case, the cost will be repaid subsequently by the owner. The national forestry fund may also be used for financing laboratories, research stations, and scientific missions; for the establishment of nurseries and seed-drying installations; for research work abroad or in the overseas territories; and for the importation of seeds and plants.

Silviculture and Reforestation

CANADA

From the start of large-scale forest exploitation in British Columbia, clear-cutting has been general and has accounted for approximately 1.2 million hectares (3 million acres), mainly of Douglas fir, *Pseudotsuga taxifolia*, and hemlock, *Tsuga heterophylla*. As exploitation proceeded, it became evident that the economic future of the province depended in great part on the possibility of obtaining a continuous revenue from these vast, wooded areas. Climatic conditions are extremely favorable and very considerable progress is being achieved. A clear-cutting method now being used practically ensures natural regeneration. It is a patch logging system with "patches" of 52 hectares (130 acres). These are surrounded on two sides at least by stands which will not be cut until three to eight years later, when regeneration will already be well under way. Once the forests have been cut over, the slash is burned in order to eliminate fire hazards. This system requires a network of logging roads, and maintenance costs are higher, but the advantages outweigh the disadvantages.

The Forest Service of British Columbia has greatly expanded its nurseries. Annual output is now 20 million two-year-old plants of Douglas fir sufficient for the reforestation of 10,000 hectares (25,000 acres) counting 2,000 plants per hectare (800 plants per acre). The method used in the nurseries is first based upon practical experiments to determine by weight the quantity of seeds to be used in each seed-bed. The beds are then laid out in the spring, 15 m. (50 ft.) long by 1.20 m. (4 ft.) wide, and are spaced so as to allow for the passage of tractor wheels between them. They are then enclosed by wooden frames, dug up, and leveled. Seed is broadcast and then covered by earth spread mechanically. Ten days later a kind of flame-thrower is passed over the beds to burn weeds, resulting in a 50 percent saving in weeding costs. As soon as germination starts, the beds are covered with a trellis of planking and wire which, in turn, is covered at the onset of winter with straw, in order to avoid frost damage. At the end of the first year, the main roots are pruned in place by a special tractor-drawn blade that does not disturb the beds. At the end of the second year, the plants are pulled by hand and packed in bundles of 100 by a special machine which covers the roots with damp moss and envelops the young plants in waxed paper to protect them against desiccation and temperature changes. They can be kept in cellars in this way up to one month.

CEYLON

Forest research is centered mainly on the principal species of the island. Special studies are made of indigenous and exotic species such as the jak, *Artocarpus integra;* the nedun, *Pericopsis mooniana;* underplanted with mahoganies, *Swietenia mahogani* and *Swietenia macrophylla;* teak, *Tectona grandis;* blue gum, *Eucalyptus globulus;* etc., particularly on their reactions to thinning and pruning. Natural regeneration in relation to density of stands is studied separately for dry, mixed evergreen forest; coastal, wet evergreen high forest; and inland, wet evergreen high forest. Regeneration under various silvicultural methods of management is also studied. Special research is devoted to dry, scrub jungle and to methods of introducing the species best suited to the particular soils occurring there. Experimental work is carried out on wind-belts and on various methods of combatting soil erosion.

FRENCH WEST AFRICA

The introduction of forest trees from Indo-China into French Guinea has shown very interesting results. Planted on a plateau, new stands have halted the formation of lateritic soil pan and are apparently restoring the soil to normal. Furthermore, these exotic species have succeeded in forming balanced plant associations with normal regeneration, unhampered by competition from indigenous flora. Another interesting point is that the dense canopy formed by these pines of Indo-China — *Pinus khasya*, *Pinus merkusii* and *Styrax tonkinense* — after rapid growth, precludes ground fires.

PORTUGAL

Cork oak forests have an importance of their own. Their management is not controlled by the Forest Service, which confines its assistance to advice and research. Practically all cork oak forests are privately owned. Research is conducted on regeneration, usually natural, and on methods and techniques of cutting the cork bark and on its utilization. Particularly in recent years, genetics has assumed great importance and progress is being made in its application.

UNITED KINGDOM

A card index covering the whole of Britain's woodlands is being undertaken as a two year job by 50 tree experts. At the completion of the task, the Forestry Commission's research headquarters will have a record of every type of tree, its condition, its age, and an estimate of its rate of growth. This information will be used in carrying out the plan of developing 2 million hectares (5 million acres) of effective woodlands in the next 50 years.

UNION OF SOUTH AFRICA

It is planned to plant 52,000 hectares (130,000 acres) during the next four years with Mexican teocote, *Pinus pseudostrobus tenuifolia*, and with a variety of *Pinus caribaea* from Honduras. These species have proved of outstanding interest because of their rapid growth; at the age of 30 their average height is 30 m. (98.5 ft.) and their diameter 45 cm. (17.8 in.). The program is dependent on the adequate collection of seeds in Mexico and Honduras, coupled with research work as to the precise origin of the strains introduced in South Africa. An officer of the Union of South Africa Forest Service has been sent to Central America for this purpose.

During 1946, experiments were carried out on different strains of *Pinus taeda* which showed that some strains grew almost twice as tall as others. Some specimens of *Pinus palustris* have been found to grow at a far greater rate than normal trees. A semievergreen type of Lombardy poplar has been introduced from Chile and promises to be a useful windbreak species for the winter rainfall area.

UNION OF SOVIET SOCIALIST REPUBLICS

The reforestation program for the first half of 1947 included the planting of more than 133,000 hectares in various species. Reforestation was particularly successful in the Ukraine and in the provinces of Rostov, Tula, and Kaluga.

Forest Fires

AUSTRALIA

The 8.1 million hectares (20 million acres) of forest lands of Victoria are exposed to extremely severe fire hazards at certain periods. During five months of hot, dry summer these stands, comprising 400 different species of eucalypts, Myrtaceae, Epacrideae, and Xanthorrheae—all rich in essential oils—,constitute a perfect powder magazine. The worst fire on record was that of January 1939, when more than 1.4 million hectares (3.5 million acres) were burned over, destroying sawmills, farms, and cattle and killing 71 people. Since then a road construction program, fire-fighting regulations and special fire-fighting training have been integrated into a complete defense system. A central service has been established in Melbourne which keeps in touch by wireless or telephone with hun-

dreds of observation towers. Special teams, equipped with radios, power pumps, flame-throwers, etc., are held in readiness at strategic points. Special attention has been paid to the radio network. At present there are 18 base radio stations, together with 80 satellite stations. Liberator and Mustang aircraft are used for aerial observation and for fire fighting with water bombs. A new development is the use of a 20 percent solution of sulphate of ammonia for the fire-fighting bombs. Experiments have shown that these bombs are very effective in putting out fires in regions which would normally be wholly inaccessible.

CANADA

A network of 270 radio stations is helping to protect the forest resources of British Columbia. It is intended to expand this network further. Stations range from large operating headquarters in each forest district down to small portable sets that can be carried to the scene of fires on the remotest mountain tops. This activity reaches its peak during the fire season, when it links up all forest headquarters to the more than 100 little patrol boats plying the coastal waters, to aircraft patrolling the forests in the interior, and to foresters patrolling their beats on horseback.

Forest Enemies and Pests

AUSTRIA

Recently, infestation has been severe in coniferous forests and both fir and spruce have been heavily attacked by the grubs of *Tomicus typographus* and other Bostrichids. The estimated damage incurred because of hot, dry weather has been great. The authorities are endeavoring to prevent the spread of the pest but this effort is largely ineffective, as the work is hampered by lack of material and funds and by a shortage of labor.

CANADA

In Nova Scotia, as well as along the entire eastern seaboard, birch has become the victim of a "dieback" which is gradually wiping out the species. All efforts to stop the disease have failed. It is thought that it will become necessary to relax timber controls in order to harvest some 2.7 million m^3 (600 million board feet) of birch which, otherwise, would be a total loss in five years' time.

In British Columbia, exports of western red cedar, *Thuja plicata*, have been mounting steadily. However, decay of the heartwood of living trees is causing justifiable anxiety. Research has shown that *Poria asiatica* is responsible for black rot. Traces of this kind of decay are found as high up as 80 ft. above ground. White and yellow rot are apparently caused mainly by *Poria albi pellucida* in the coastal region and by *Poria weirii* in the interior. The worst damage is caused by *Poria asiatica*, which affects 70 percent of inland trees suffering from decay and 50 percent of those on the coast. It is responsible for an estimated average timber loss of 10 percent of the volume felled.

UNITED STATES OF AMERICA

Hybrid pines may prove to be the answer to the pine weevil, *Cylindrocopturus eatoni*, which is threatening various varieties of pine. Spraying of DDT from aircraft and from the ground has shown good results, but the introduction of resistant species would be a far better solution. One hybrid variety was obtained by crossing the hybrid of *Pinus jeffreyi* x *Pinus coulteri* with *Pinus jeffreyi*. This hybrid was exposed to attack like the other pines but showed excellent resistance. The reason has been observed. The larvae coming out of the eggs deposited under the bark were not capable of getting as far as the cambium, because the tree reacts to the attack by rapidly producing cells which isolate the passage bored by the insect from the cambium itself, so that the larvae cannot develop and therefore die. This characteristic appears to be hereditary.

Forest Products

Technology

BRAZIL

The State Department of the United States has announced the establishment of a joint United States-Brazilian technical commission to draw up a program for the full development of Brazilian resources.

The six-member commission will analyze Brazil's natural and capital resources, its labor supply, fiscal and banking problems, domestic and international trade issues, and its position in the world economy. It will also consider measures to encourage the flow of private capital into Brazil and may make recommendations on measures which might speed the country's economic development.

CANADA

In 1943 the Forest Products Laboratories, at the suggestion of the pulp and paper manufacturers, undertook research on the chemical barking of trees. After three years of investigations several chemicals were established as satisfactory, and a procedure for applying them to standing trees was worked out. Soluble arsenic, ammonium sulphamate, sulphamic acid, and sodium chlorate have proved the most effective of those used in the experiments. These chemicals are applied to trees in the form of a paste during the "peeling" season in spring and early summer. The first step is to remove a strip of bark round the tree so as to expose a 6.4 cm. (2½ in.) band of sapwood. This can be done with a double-bladed hand saw held at chest level. Chemicals are applied to the bare sapwood and held in place by a crepe kraft paper bandage 7.6 cm. (3 in.) wide. The poison is carried up and down the tree between the bark and the wood, quickly killing the tree and leaving it in such condition that the bark may be readily removed by a quick twist of the woodsman's de-barking tool. Of all the chemicals tested arsenic proved to be the speediest and most effective in removing bark and in providing protection from blue-stain and bark insects which frequently attack dead trees.

CHINA

The Kaiting Forest Products Laboratory has completed much original research work on Chinese timbers during the past few years. The Laboratory, which is a unit of the National Bureau of Industrial Research, conducted systematic investigations on the most important Chinese timbers with respect to their classification; supplies; and structural, physico-mechanical, seasoning, and preserving, as well as woodworking, properties. In all, over 20,000 physical determinations of moisture content, specific gravity, and shrinkage of wood, and 2,000 mechanical tests have been made. Although equipment and heavy machinery is still wanting, a number of preliminary results have been obtained and over 20 technical papers have been written. China possesses more than 2,000 species of trees, but information about the dominant timber-producing trees is very incomplete. To meet such deficiencies several expeditions to exploitable forest areas have been organized by the Kaiting Laboratory.

SWEDEN

The Swedish Forest Products Research Laboratory, Stockholm, with a staff of 95 qualified research workers and assistants, is endeavoring to find new ways of using Swedish wood and of improving forest products. The institute comprises three departments, one for paper, one for wood chemistry, and one for wood technology. The Department for Wood Chemistry is engaged, *inter alia*, in the important task of solving the riddle of lignin. About 30 percent of wood consists of this substance, but as its chemical nature has not been fully known the wood-chemical industry has not been able to utilize it practically. So far it has been used mainly as a poor fuel. However, promising results have now been attained. By exposing the wood cells to ultraviolet rays, the Swedish research workers have localized the situation of the lignin in the cells, and they have partially succeeded in revealing its chemical structure.

UNITED KINGDOM

The study of plywood and of the gluing of wood at the Forest Products Research Laboratory, Princes Risborough, England is carried on in the Composite Wood Section which came into active being in 1939. Its plant allows a thorough study of each of the processes involved in plywood manufacture and of the machinery itself, and it is hoped that it will enable as wide as possible a range of timbers to be assessed for their qualities in veneer and plywood manufacture. The study of the machinery, however, although important, forms only a part of the work, and some 50 percent of the Section's time is devoted to the study of glues, their methods of use, and behavior in service and testing. Several thousands of plywood panels have been made at the Laboratory, using a wide range of glue types, and they are being exposed to the weather over a period of 10 years. Glues

are under test also in other types of construction such as in ply-clad frames for housing purposes and in laminated beams. Extremely severe conditions will be provided for tropical houses. The technique of building up glued structures other than simple plywood is under continuous study. This includes the manufacture of curved and molded plywood by the rubber bag and other methods, the design of jigs and presses, and the investigation of methods of applying heat.

Industrial Equipment

NORWAY

The purchase from Canada of motor-driven chain saws for use in Norway's forests is part of a program to modernize logging equipment and methods in order to increase timber output for reconstruction.

PANAMA

Mahogany, *Swietenia* spp., and Santa Maria, *Calophyllum* spp., lumber are to be the chief species processed by a new mill with a capacity of 28,320 m³ annually. Small quantities of cedar, *Cedrela* spp., amarillo, *Centrolobium patiuense*, and other local woods will be milled. The timber will be cut in the province of Darien and will be transported for sawing to the mill which is situated near Panama City. Extensive study and tests of Santa Maria wood were made in 1943 and since then extraction of the wood has been increasing steadily. It has proved to be very satisfactory as decking on flat cars and also has been found suitable for keel blocks, guard rails for piers, and flooring in houses.

UNITED STATES OF AMERICA

A portable wood chipper has been developed in order to recover almost everything but the stumps after felling operations. The unit consists of a 1.2 m. (47 in.) chipper mounted on a portable truck and driven by a 100 h.p. Diesel engine. After logging operations, the machine is taken into the stand and the tops and slash are cut into convenient lengths and thrown into the chipper, thus saving what would normally be wasted.

A device in the form of tree shears to cut down trees up to pulpwood size more easily and quickly than with a portable power saw has been developed in Texas. The shears are operated in conjunction with a tractor and are said to be capable of cutting as fast as the tractor can move from tree to tree.

Numerous technical developments brought about by the war are being put to good use in many spheres of industry. Army mine detectors are being successfully used for locating metal in logs. The mine detector consists of a search head or scanning disc connected through a handle and control box with an amplifier and a resonator or miniature loudspeaker. When the search head passes over metal within a given distance it gives a signal on the resonator, earphones, or dial, according to the equipment used. Veneer mills troubled by embedded metal in their bolts or logs as well as sawmills recutting used timber containing nails and other metal objects could obviate much trouble by the use of metal detectors. The short tabulation (following) gives the results achieved with a mine detector during one month by a mill sawing logs cut from trees which had been worked over for naval stores production.

During One Month	Before		After	
	Times	Work Lost	Times	Work Lost
Struck metal	32	192 min.	4	24 min.
Chopped out nails on carriage	6	33 min.	3	14 min.
Jump-butted logs on carriage	2	10 min.	0	0 min.
	40	235 min.	7	38 min.

A special X-ray machine with a fluoroscope has been built for a company that was confronted with the necessity of salvaging lumber from an old bridge trestle. The operator looks through the fluoroscope of this experimental machine and marks the location of pieces of metal with a spray of paint. The marked sections are then cut out before running through the resaw.

Preservation and Drying

AUSTRALIA

The Queensland Forest Service has published results of a study to determine the seasonal variation in the moisture content of several Queensland woods protected from rain but exposed to outdoor atmospheric conditions in Brisbane and the principal sawmilling centres in North Queensland (about 17° S. latitude). It was found that the average equilibrium moisture content was higher in North Queensland than in Brisbane, varying with the species and locality. At Yungaburra, where the average was 20 percent for hoop pine, *Araucaria cunninghamii* 21 percent for satinay, *Syncarpia hillii*, and 19.5 percent for silky oak, *Cardwellia sublimis*, the moisture content was about 5 to 7 percent greater than in Brisbane.

The New South Wales Forestry Commission recently purchased a pressure creosoting plant which was utilized during the war for creosote treatment of timber for munitions and government purposes. The plant will be operated by the Commission's Division of Wood Technology and, in addition to creosoting timber on behalf of government authorities, will be used to give working demonstrations in the preservation of timber. These demonstrations will constitute part of the Division's extension services in advocating the preservation of wood for various fields of use. Until this plant was installed during the war no equipment was available in Australia for pressure impregnation of commercial quantities of timber. For purposes where high resistance to decay and to insect and marine borer attack was required Australian hardwoods of natural high durability were generally chosen.

Many broad-leaved trees of large size and good form, which were formerly left in the forest when well known timbers such as mahogany and cedar were extracted for marketing, have wide bands of sapwood, often wider than 16 cm. (6 in.), which would be severely damaged or even completely destroyed by powder-post Lyctus borers after conversion. Successful marketing of such woods, chiefly of tropical and subtropical occurrence, can be achieved only if an effective preservative treatment is given to the sapwood. Several sawmills have installed, or are planning to install, treating equipment for immunizing the sapwood of such timbers against Lyctus damage. In New South Wales the sale of furniture made from such woods which have not been treated is prohibited. Methods dependent on open tank treatments and diffusion of hot boric acid solutions into the wood are being employed. During the past decade a number of plywood factories have been using sapwood veneer of these timbers impregnated with boric acid to make them immune to Lyctus damage. This successful treatment of sapwood veneers has been followed by investigations to develop the methods of treatment of sawn timber which are now being used.

CHILE

Creosoting wood is to be started by a factory being built with an annual capacity of 825,000 m³. The principal products are sleepers for railways. There will also be some production of telephone poles and timber for the building industry.

NIGERIA

One of the main problems to be overcome in the use of wood sleepers for railway construction in the tropics is prevention of the ravages of termites. During the war the difficulties of obtaining metal sleepers made it necessary to use wooden sleepers to a greater extent. Under tropical conditions in Nigeria, wooden sleepers usually have only about 7 years' service life as against the 30-35 years of steel sleepers. It was decided, therefore, to endeavor to make wooden sleepers impervious to termites and dry rot. After three years experimentation in laboratories in England, a plant was erected on the spot in order to treat hardwoods for use on the Nigerian railways. Ready-cut lengths of timber are brought to the plant where they are sorted out according to species. After passing through the adzing and boring equipment, which is capable of handling 900 sleepers a day, the timber is impregnated under pressure with hot creosote. Over 250 sleepers at a time can be wheeled into long cylinders from which the air is sucked out while at the same time the creosote is forced in at a temperature over boiling point. The normal output is 750 treated sleepers a day. The sleepers will have to be used for 10 years before their resistance can be fully assessed but it appears already that a definite increase in the life of wooden sleepers in the tropics has been made possible.

UNITED STATES OF AMERICA

In 1946 the inspection of a test track in Montana brought to a close a study that was started in 1910. The test was originally designed to determine the desirability of Inland Empire western hemlock, *Tsuga heterophylla*, as a tie (railway sleeper) species. The fact that some other species were also taken into consideration only added to the many benefits the study has provided. A total of 1,800 ties consisting of both sawn and hewn varieties were included in the test. Of this total, 1,072 were western hemlock, *Tsuga heterophylla*, 436 western larch, *Larix occidentalis*, 166 Inland Empire Douglas fir, *Pseudotsuga taxifolia*, 102 true fir, *Abies*, 18 Engelmann spruce,

Picea engelmanii. The ties were purchased in 1909 and were treated by the Lowry pressure process. An 80-20 solution of coal-tar creosote and refined coal-tar oil was used as a preservative, and an average retention of 108 kg. per m^3 (6.75 lb. per cu. ft.) was obtained. Ties were not incised or bored. Final computation of the results was made in 1946; it showed western hemlock to have an average life of 30.6 years; western larch, 33.4 years; true fir, 29.7 years; Douglas fir, 35.4 years; and Engelmann spruce, 25.3 years.

Plywood and Gluing

INDIA

The plywood industry consists of about 80 factories with a capacity of approximately 6.5 million m^2 (70 million sq. ft.) and was started after the First World War. The Second World War gave great impetus to the industry, particularly to the manufacture of tea chests. For the 3 years from 1947 to 1950, it has been estimated that 14 million m^2 (150 million sq. ft.) of plywood will be required to meet India's yearly demands. About 9.3 million m^2 (100 million sq. ft.) of plywood would be used for tea chests and 4.6 million m^2 (50 million sq. ft.) for domestic commercial use. It is anticipated that the logs required can be supplied from the forests of India but that sufficient casein is produced annually for only 3.7 to 4.6 million m^2 (40 to 50 million sq. ft.) of plywood.

UNITED KINGDOM

A new demountable barrel has been devised to save space when empty beer barrels are being transported back to the brewery. The barrel is assembled by fitting 10 laminated wood staves, lined with oak, into grooves of the barrel ends, then slipping on hoops and hammering them into position. The staves, it is claimed, keep their shape without expansion or shrinkage. Reassembling the barrel is said to be possible in about one minute.

Pulp and Paper Industries

FINLAND

A new method has been developed for the quantitative and qualitative determination of sugars in sulphite waste liquor based on the disassociation of sugar bisulphites into sugar and bisulphité. Results show that: (1) The hemicellulose of sprucewood mostly consists of mannans. Mannose is the altogether predominant hexose in the sulphite waste liquor. (2) Sprucewood also contains galactans. Galactose is found in strong pulp waste liquors, but is destroyed in rayon pulp waste liquor during the cooking process. (3) Sprucewood does not contain any readily hydrolized glucosan. The presence of glucose in strong pulp waste liquor cannot be proved, nor is there reason to assume that the wood should contain some slowly hydrolized polysaccharides of glucose fundamentally different from cellulose. The glucose in rayon pulp waste liquors may be well assumed to originate from hydrolysis of the cellulose. The reaction during the cooking of rayon is sufficiently acid to justify the assumption.

PHILIPPINES

A paper mill with a capacity of 30 tons per day is to help the industrialization program. Six or seven such mills have been recommended for construction in the next few years to provide eventual self-sufficiency in paper production both for newsprint and industrial uses such as paper bags. The first mill is to be erected in conjunction with a sugar-refining plant in order to make use of the digester plant for converting raw materials to pulp. Local fibers adapted to papermaking include the waste of abaca (Manila hemp), maguey, cogon grass, rice husks, bamboo, ramie, and bagasse. Paper imports in 1940 were 62,000 tons for all purposes.

SWEDEN

Fuel corresponding to 300 kg. of anthracite per ton of manufactured sulphite pulp is to be extracted from sulphite liquor by a process developed at the Institute for Wood Research. This would be enough to supply sulphite factories with 50 percent of their fuel requirements.

The Association of Waste Paper Dealers estimated that 100,000 tons of waste paper can be collected every year in Sweden alone. This would furnish raw material for approximately 75,000 tons of paper. It is thought that in summer the amount of waste paper collected will be higher since old newspapers will not be used so much for fire-lighting purposes. From only one large factory near Stockholm 8,000 kg. of office waste paper were collected in one week.

UNION OF SOUTH AFRICA

A new industry in Natal will turn home-grown timber into hard and soft boards at a rate of 5.5 million m^2 (60 million sq. ft.) a year. The plant, the first in South Africa, is to embody the newest ideas and will be able to turn out a full range of products from standard insulating and ceiling boards to a very dense hardboard which will be smooth on both sides.

UNITED KINGDOM

Straw had to be used as raw material for papermaking when the mills were cut off from their traditional sources of supply during the war. Now that normal supplies are becoming available again, less straw is being used. It may, therefore, be of interest to quote figures showing the possibilities developed during the wartime shortage. The straw consumption by the paper and board industry was as follows: 1941, 127,000 tons; 1942, 249,000 tons; 1943, 303,000 tons; 1944, 328,000 tons; 1945, 346,000 tons; 1946, 295,000 tons. The view has been adopted among paper men that straw may now be regarded as a raw material in its own right and not merely as a substitute for other fibers. A powerful argument in support of this claim is that straw is a home-produced raw material and its use does not entail any expenditure of foreign currency. Another point in favor of straw is that its transport does not make any demands on merchant shipping. During and since the war considerable advances have been made in the processing of straw in paper and board mills. Yields of 45-50 percent bleached pulp from straw have already been claimed and research directed towards the attainment of better results continues.

UNITED STATES OF AMERICA

De-inked waste newsprint is to be used to make new newsprint. The process to be used is described as a cold water process with low conversion cost and no loss of fiber. The process is said to be both chemical and mechanical, requiring about 30 minutes from waste paper to de-inked pulp.

Container board manufacture is to be serviced by a new sulphate plant for the production of unbleached pulp. It will operate in conjunction with a complete lumber plant with kiln-drying and planing facilities. The sulphate mill unit is another step in a long-range planned program of integrated wood utilization being worked out in the Northwest. Thorough consideration is being given to several processes and products that would use the waste incidental to lumbering and sawmill operations. The unbleached sulphate container board mill is considered one of the most suitable means for this integrated wood utilization since it will operate entirely on slabs, edgings, and trimmings from the sawmills and undersized trees, and chunks and tops from logging operations.

Increased demands and higher market prices for turpentine and its component fractions have created an additional source of revenue for manufacturers of pulp. Within the past year, four pulp and paper manufacturers have installed turpentine recovery equipment and a high return has been realized upon the investment. Crude turpentine, or pinene, can be recovered from certain coniferous pulpwoods, particularly southern yellow pine, *Pinus echinata*, and long leaf pine, *Pinus palustris*, during the cooking period of a wood charge in digesters. The extent of recovery varies from 1½ to 4 gallons per ton (6-17 liters per metric ton) of pulp produced, depending on the type of wood, its age, and location. In addition to obtaining turpentine, the modern equipment recovers heat in the form of hot water for washing pulp and other mill use.

Construction

UNITED KINGDOM

The two last timber viaducts on the Great Western Railway are now being dismantled. They were constructed around 1855. For some time past a branch line, of which the viaducts form a part, had been idle, and the viaducts are being removed for the sake of the timber amounting to 5,200 m^3 (25,000 cubic feet). Part of this is to be used as new flooring in the carriage and wagon repair shops and the remainder is to be used as shuttering, piling for footbridges, etc.

UNION OF SOVIET SOCIALIST REPUBLICS

A building material is reported to have been taken into use as a satisfactory substitute for lumber, brick, slate, and corrugated metal roofing. It is manufactured by a very simple process with inexpensive machinery. The fibrous substance, made of reeds, straw, textile, paper, and other wastes, is boiled in alkaline (lime) solution, then soaked in water and ground up. During the grinding process, the fiber is treated with a resinous substance. The resulting liquid pulp, which at this point contains 60-70 percent moisture, is poured under pressure into wire net molds *in vacuo* and put into driers. The material is said to be both heat- and water-resistant. Its in-

sulating properties are such that it is to be used extensively for dwelling and other construction in the Arctic. A roof made of this material should not weigh more than one-tenth of the weight of a tile roof and one-half of the weight of a sheet iron roof. It does not require any beams and rafters and is easily erected. It is said to be leak proof and to withstand sudden changes in temperature. The material is claimed to be neither brittle nor fragile.

Waste Utilization

SWEDEN

A wax-like material from the bark of pine trees promises to become one of the most important substances in plastics manufacture. The bark product is called phlobaphene and constitutes a new and cheap softening agent or plasticizer. Manufacture of phlobaphene from the bark which cannot now be used by the lumber and pulpwood industries would not only solve a major waste problem but would also give the plastics industry a new material. The plasticizers from bark are suitable for replacing plasticizers from castor oil and alkyd products, as well as the phthalic acid derivatives made from coal. Up to 30 percent of synthetic resins produced consist of the plasticizers. Thus the number of uses for bark materials will be large.

UNITED STATES OF AMERICA

In the Douglas fir region of the states of Oregon and Washington the commercial production of five bark products has been started. This operation, tapping a new source of raw materials, is a significant step towards a complete utilization of forest resources and is also of considerable importance in achieving sustained-yield management and stable employment of forest workers. Bark, long considered almost worthless in milling, represents approximately 12 percent of a sawlog. Under the new process, bark now yields these main components: cork flakes, short fibers, tissue powder, a cork-fiber combination, and a cork-fiber-powder combination. The materials have been proved valuable for a variety of uses especially in the plywood, glue, plastics, insecticide, and soil-conditioning fields. Only the thick bark of the Douglas fir is used for the time being. The bark of all Pacific Coast conifers is usable, but as they differ chemically and physically, they would have to be processed separately. The total output of bark products is to be 35 tons daily.

Economics and Statistics

BRITISH HONDURAS

Mahogany logs and lumber are the main items in the economy of British Honduras. Exports in 1946 were 19,000 m^3 as against 26,000 m^3 in 1938. Contract prices may have to be increased to meet present costs of production. There is a continuing demand for mahogany as well as for secondary woods. Difficulty is being experienced in finding substantial supplies of cedar required by Jamaica for cigar boxes.

CANADA

The export of spruce, *Picea* spp., balsam fir, *Abies balsamea*, and jackpine, *Pinus banksiana*, in unprocessed form or as pulpwood logs from the Crown lands of Ontario to the United States is to be reduced until it is completely eliminated in the next ten years. The scheme would work as follows: (1) those who have built pulp mills in Ontario and now have permission to export pulpwood will have their present quota reduced by one-tenth each year; (2) those given export rights as a consideration for assisting in the erection of new pulp mills by vacating areas previously allotted them will have their quota reduced progressively by ¼ of their last annual exports; (3) those who have been working on short-term arrangements without any consideration such as mentioned above will have their quota reduced progressively each year by ⅓ of their last annual exports.

NEWFOUNDLAND

The Newfoundland pulp and paper industry is rapidly assuming a dominant role in the country's economy. In 1938 two paper mills gave employment to 7,000 men. With the expansion now taking place it is estimated that at the end of 1948 the industry will give permanent or semipermanent employment to 15,000. The output of the country's largest mill has been contracted for on a long-term basis and the entire production over the next ten years has been sold. Returns in the form of salaries and wages to the permanent employees of the paper companies are, on the whole, higher than those received by fishermen, and the present growth in pulp and paper production should assist materially in maintaining or raising the general standard of living.

UNION OF SOUTH AFRICA

Exports of wattle extract amounted to approximately 65,600 tons in 1946 as compared to 66,300 tons in 1945. The United Kingdom took 45 percent and large shipments also were made to the United States of America and Australia. Smaller shipments went to India, New Zealand, Canada, the Middle East, and China. Buying by users on the continent of Europe was resumed. Wattle bark exports were approximately 52,600 tons in 1946 against 43,000 tons in 1945. India took 40 percent and the United States nearly 30 percent. Australia and the continent of Europe purchased moderate quantities. Exports to China were resumed on a small scale.

Meetings and Conventions

The Forest Products Research Society, which was inaugurated early in 1947, held its first National Meeting in Chicago, U.S.A., on 31 October and 1 November. Membership of the Society, which aims at furthering the extension of research and its application to various phases of forest products industries, is now more than 1,000. Members are chiefly from the United States of America and Canada, but there are also members from Australia, Belgium, China, England, France, India, the Netherlands, New Zealand, Norway, Philippine Republic, Sweden, Switzerland, Union of South Africa, and the United Kingdom.

Personalities

Professor Valno Auer of Finland has been named honorary Director of Forestry in Argentina. He is currently studying the classification of soils and the evolution and formation of peat moss in Patagonia and its possibilities as fuel. Research work on several other promising aspects of Patagonian economy are being carried out under the Ministry of Agriculture.

Mr. J. M. Cockburn has been appointed Chairman of the Timber Development Association in the United Kingdom. He has been an active member of the TDA Council since its reorganization several years ago.

In Burma, U Hman has been appointed Chief Conservator of Forests.

Mr. D. T. Griffiths, formerly Chief Conservator of Forests, Burma, has been appointed Chief Forest Advisor to the Union of Burma.

Dr. B. A. Keen has been appointed to the post of Director of the new British East African Agricultural and Forestry Organization.

The post of Inspector-General of Forests to the Government of India, filled by Mr. A. P. F. Hamilton, is being retained and he will continue to be head of the Indian Forest Service and Advisor to the Government of India on forestry and connected matters.

In Pakistan, Mr. J. Petty has been appointed Inspector-General of Forests.

Mr. D. Roy Cameron, former Dominion Forester of Canada, has assumed charge of the European working group at Geneva, Switzerland. Mr. Cameron has been closely associated with the FAO forestry program since its inception. He was a member of the Interim Commission on Food and Agriculture, the temporary organization which drew up the FAO Charter adopted at Quebec in 1945. He attended the Quebec and Copenhagen Conferences and served as a member of the Food and Agriculture Organization's Standing Advisory Committee from its formation to the present time.

Mr. P. Sartorius, Switzerland, a former federal inspector of forests, has also joined the European group. Mr. Sartorius is well known for his work in organizing Switzerland's war-time economy in the timber field.

Mr. Pierre Terver has been appointed a chief of section in the Forest Products Branch of FAO's Division of Forestry and Forest Products. He was formerly Chief of the Forest Service of the Ministry of French Overseas Territories. His academic career began at the Institut National Agronomique in Paris in 1929, and was continued at the Ecole Nationale des Eaux et Forêts of Nancy in 1931. He has held a professorship of tropical forest economy, trade, and utilization of tropical woods at the Advanced School of Tropical Agronomy, and has organized training courses for officers and inspectors of the Colonial Forest Service as well as being a professor at the School of Public Works. He has also acted as Secretary-General of the Conseil Superieur de la Protection de la Nature dans les Territoires d'Outre-Mer and of the Conseil Superieur de la Chasse dans les Territoires d'Outre-Mer.

Mr. Jorge Succar, Peru, has left the Forest Products Branch of FAO's Division of Forestry and Forest Products and is at present serving as secretary to the FAO Mission to Venezuela.

THE Nations accepting this Constitution, being determined to promote the common welfare by furthering separate and collective action on their part for the purposes of

raising levels of nutrition and standards of living of the peoples under their respective jurisdictions,

securing improvements in the efficiency of the production and distribution of all food and agricultural products,

bettering the condition of rural populations,

and thus contributing toward an expanding world economy,

hereby establish the Food and Agriculture Organization of the United Nations . . . through which the Members will report to one another on the measures taken and the progress achieved in the fields of action set forth above.

—Preamble to the Constitution of the Food and Agriculture Organization of the United Nations

FAO Member Nations

Australia
Austria
Belgium
Bolivia
Brazil
Burma
Canada
Chile
China
Colombia
Costa Rica
Cuba
Czechoslovakia
Denmark
Dominican Republic
Ecuador
Egypt
Ethiopia
El Salvador
Finland
France
Greece
Guatemala
Haiti
Honduras
Hungary
Iceland
India
Iraq
Ireland
Italy
Lebanon
Liberia
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Mexico
Netherlands
New Zealand
Nicaragua
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Pakistan
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Paraguay
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Portugal
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Switzerland
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